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Strategies Used by Hospitals in a Southeastern State to Reduce Catheter Associated Urinary
Tract Infections: Comparing the Outcomes by Hospital Structure and Processes

A dissertation

presented to

the faculty of the College of Nursing

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy in Nursing

by

Furnell Rife

December 2012

Dr. Janne Dunham-Taylor, Ph.D., Chair

Dr. Joellen Edwards, Ph.D.

Dr. Patricia Hayes, Ph.D.

Dr. Lois Lowry, Ph.D.

Keywords: Structure, Process, Outcome, CAUTI

ABSTRACT

Strategies Used by Hospitals in a Southeastern State to Reduce Catheter Associated Urinary
Tract Infections: Comparing the Outcomes by Hospital Structure and Processes

by

Furnell Rife

Catheter-Associated Urinary Tract Infections are considered a clinical indicator of quality of care. A descriptive research study was conducted to identify the strategies used by hospitals to reduce or eliminate CAUTIs. Infection Control Preventionists were surveyed. In a predominately rural southeastern state, this study demonstrated that about 40% of hospitals surveyed are implementing CAUTI prevention processes.

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DEDICATION

This dissertation is dedicated to my loving husband Jim who has endured the hardship of this long, arduous journey. He has been my Rock of Gibraltar; my sounding board, critic, cheerleader, editor, and wonderful husband. He constantly encouraged me when I felt like giving up. He kept the house running and spent many long, lonely days, evenings, and weekends while I was glued to my computer. Without him I would not have been able to accomplish this task. I hope we have many more years together so we can make up for the sacrifices he has made for me.

This dissertation is especially dedicated to my mother who I wish could be here with me to enjoy my success. She was a Licensed Practical Nurse and worked night shift for 36 years. She was a divorced mother with two small children and received no help from my father. She was dedicated to her work as a nurse, to her hospital, and to her patients and seldom missed a shift. She set a standard that was an inspiration to my brother and me and thus we inherited her work ethic and perseverance in achieving our goals. My mother was taken from us much too early as a result of Alzheimer's and sepsis due to an untreated urinary tract infection. I am concluding my nursing degree and giving her the highest honor I can give by researching the disease that took her from me. My greatest desire is that this research will bring information that can be used to assist nurses in implementing measures to reduce or eliminate catheter associated urinary tract infections so other mothers may have the opportunity to live longer and share their children's successes.

ACKNOWLEDGEMENTS

I can do all things through Christ who strengthens me. (Philippians 4:13).

Without my Lord and Savior's strengthening to sustain me, this endeavor would have never been possible. I have asked many times for his strength and guidance. I am reminded of my favorite hymn *Amazing Grace* the third verse:

Through many dangers, toils and snares...

I have already come.

T'was Grace that brought me safe thus far...

and Grace will lead me home.

Even though my poor words can never express my deep gratitude, I want to give a special acknowledgment to my dissertation chair Dr. Janne Dunham-Taylor, whose careful guidance, unwavering support, and endless patience pointed me in the direction of success. I deeply appreciate my committee members, Dr. Joellen Edwards, Dr. Patricia Hayes, and Dr. Lois Lowry, for their support and encouragement. I had the pleasure of studying under their guidance during my course work at ETSU. I have often wondered when I first sat in their classrooms if my facial expression showed my wide-eyed amazement at the beautiful world of knowledge they opened for me. With my heart, I thank-you and I will try my level best to be worthy of your efforts and trust.

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CHAPTER 1

INTRODUCTION

Healthcare-associated infections (HAIs) exact a significant toll on human life. They are among the leading causes of death in the United States and account for an estimated 1.7 million infections that included 99,000 associated deaths in 2002. Healthcare-associated infections are a significant cause of morbidity and mortality in hospitals. In 2009 the Centers for Disease Control (CDC) estimated that hospital-acquired infections add nearly \$5.7 to \$31.7 billion dollars to U.S. health care costs annually as well as substantial suffering (Klebens et al., 2007; Scott, 2009).

There are four categories of infections accounting for approximately 75% of HAI deaths in the acute care hospital setting. These four categories are:

- 1) Catheter-associated urinary tract infections (CAUTIs) that comprise the highest percentage at 34%;
- 2) Surgical site infections (SSIs) at 17%;
- 3) Central line-associated bloodstream infections (CLABSIs) at 14%;
- 4) Ventilator-associated pneumonia (VAP) at 13%.

Prevention of infection with any invasive device relies on several key elements: using these devices only when there is for an appropriate indication, inserting and caring for them properly, and removing them promptly. Indwelling urinary catheters are no exception. Despite their use in less intensive general medical and surgical wards, indwelling catheters pose significant infection risks to patients.

In this study CAUTI outcomes are compared in hospitals that have implemented the Institute of Healthcare Improvement's (IHI) four recommendations for the reduction and

elimination of catheter associated urinary tract infections. Strategies to prevent CAUTIs have focused on catheter materials, drainage systems, insertion techniques, and use of anti-infective agents. These four recommendations or interventions have been identified through various studies and by various clinical experts in infection control and prevention and can be universally recommended for all patients (Reilly et al., 2006; Saint, Elmore, Sullivan, Emerson, & Koepsell, 1998; Schumm & Lam, 2008; Society for Healthcare Epidemiology of America (SHEA), 2008; Topal et al., 2005). In order to understand the impact of the Centers for Medicare & Medicaid Services (CMS) changes to hospital reimbursement in relation to CAUTIs, it is important that we understand the background and significance of the problem.

Background and Significance

History

Catheter-associated urinary tract infections have vexed the world of medicine for over 150 years. In researching CAUTIs, the earliest writings date back to Sir Andrew Clark's findings that were published in *The Lancet*, December 1883, when he presented his observations regarding "Catheter Fever" to the Medical Society in London, England. He described how perfectly healthy, middle-aged men with no discoverable evidence of disease, with the commencement of habitual use of the catheter, were sometimes stricken by fever of the remittent type, often ending in death. In such cases no adequate structural explanation could be found (Clark, 1883).

In 1964 the *Annals of Medicine* published an article by Dr. Jack Levine describing the urethral catheter as a long-recognized, potentially dangerous instrument, which first has been

described both as man's friend and, second, as man's enemy. The indications for its use and the subsequent potential dangers thereto have been the subject of heated debate during the past few years (Levine, 1964).

Quality

One of the main principles of medical ethics is nonmaleficence, "Do No Harm," one of the enduring principles of the healthcare professions. The World Health Organization Hand Hygiene Guidelines, 2009, reported that every day 247 people die in the United States of America as a result of a healthcare-associated infection. "This is equivalent to a 767 aircraft crashing every day killing everyone on board or more than 90,000 deaths annually" (WHO, 2009). In a painful irony, however, the past reimbursement system not only failed to penalize hospitals for largely preventable harm due to medical care, but it often rewarded them in the form of additional reimbursement. That paradigm changed, however, in response to a modification to the Inpatient Prospective Payment System (IPPS), which the Centers for Medicare & Medicaid Services instituted on August 1, 2007 (Wald & Kramer, 2007).

Catheter-associated urinary tract infection is the most frequent healthcare-associated infection in the United States. Because catheter-associated urinary tract infection is common, costly, and believed to be "reasonably preventable," in October 1, 2008, the CMS chose it as one of the complications for which hospitals no longer receive additional payment to compensate for the extra cost of treatment. Thus, from a hospital's perspective, catheter-associated urinary tract infection may become an even more costly complication (Saint, Meddings, Calfee, Kowalski, & Krein, 2009). In 2008 the *Journal of Clinical Infectious Diseases* published the results of a

national study conducted among 719 hospitals, examining the current practices used to prevent hospital-acquired urinary tract infections.

Several noteworthy findings emerged from the national survey. First, only a minority of hospitals monitored which of their hospitalized patients had urinary catheters despite the strong link between catheters and subsequent urinary tract infections (UTIs). Second, the study showed no single, widely-used strategy to prevent hospital-acquired UTI. The most commonly used practices were the bladder ultrasound and antimicrobial catheters, (being used in less than one third of hospitals), and urinary catheter reminders, which have proven beneficial, (being used in less than 10% of United States hospitals) (Saint et al., 2009).

The recent research suggests that preventing catheter-associated urinary tract infections has been a low priority for hospitals when compared with other types of hospital-acquired infections. Many healthcare caregivers view urinary tract infection as the Rodney Dangerfield of nosocomial infections because it gets no respect. The low priorities given to CAUTIs mean that many hospitals have yet to use even basic strategies for their prevention. With the new CMS policy these facilities can incur substantial loss of revenue (Saint et al., 2009).

Financial Impact of HAIs and Reimbursement Issues

In March 2009 R. Douglas Scott, an economist for the Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases' Coordinating Center, at the Infectious Diseases Centers for Disease Control and Prevention, reported results from published medical and economic literature. This provides a range of estimates for the annual direct hospital cost of treating healthcare-associated infections (HAIs) in

the United States (U.S.).

Applying two different Consumer Price Index (CPI) adjustments to account for the rate of inflation in hospital resource prices, the following estimates were given: a) the overall annual direct medical costs of all HAIs in U.S. hospitals range from \$28.4 to \$33.8 billion (after adjusting to 2007 dollars using the CPI for all urban consumers), and b) \$35.7 billion to \$45 billion (after adjusting to 2007 dollars using the CPI for inpatient hospital services) (Scott, 2009).

After adjusting for the range of effectiveness of possible infection control interventions, the benefits of prevention range estimates are: 1) a low of \$5.7 to \$6.8 billion (20% of infections preventable, CPI for all urban consumers), 2) a high of \$25.0 to \$31.5 billion (70% of infections preventable, CPI for inpatient hospital services). Scott has calculated estimates for the annual cost of CAUTIs in the hospital setting ranging from an average of \$355 million using the CPI for the urban consumers to \$420 million for inpatient hospital services (Scott, 2009).

One loss for the hospital is its inability to bill for the costs associated with the extended stays resulting from the CAUTIs. A second loss for the hospital occurs at the end of the year in a market basket share penalty. Hence a decrease in the market basket share increase given by CMS occurs, ranging from 1% to 3%. The amount of the market basket share penalty would be the next year's starting point for the next round of market basket share increases. The hospital will suffer not only from an adverse financial impact from a CMS reimbursement standpoint, but, in addition, the door has been opened for potential litigation claims, and the loss of public trust caused by the publicity of medical malpractice suits. These events also bring increased scrutiny of regulatory agencies such as The Joint Commission, (TJC), Office of the Inspector General

(OIG), State Office of Licensure and Regulations, and Occupational Safety and Hazard Administration (OSHA). The actions from these groups could potentially result in loss of accreditation and licensure that would prevent hospitals from billing for any services from CMS. In addition most private health insurance companies will not pay for services rendered from a facility with this status, and malpractice insurance companies will not insure hospitals under those circumstances. For all practical purposes, under these conditions the hospital is out of business.

Statement of the Problem

The problem to be addressed in this study is whether catheter associated urinary tract infections are occurring in hospitals. Are CAUTIs in hospitals decreased when appropriate measures are implemented? The purpose of this study is to determine what measures have been implemented and their effect on CAUTI rates in a sample of rural and nonrural hospitals in a southeastern state. This was accomplished by sending an anonymous survey to the private work email of Infection Control Preventionists in each of the respective acute care hospitals in a southeastern state.

From its beginning in 1965, the Medicare program has generally paid for services under fee-for-service payment systems without regard to quality, outcomes, or overall costs of care. The problem for healthcare facilities began with the shift in reimbursements that came as one of Centers for Medicare and Medicaid Services' (CMS) major initiatives, authorized by Congress in the Deficit Reduction Act of 2005. As a result, on Oct. 1, 2008, CMS stopped paying hospitals for certain conditions that have evidence-based prevention guidelines. These conditions are

referred to as Hospital-Acquired Conditions (HAC), and Healthcare-Acquired Infections (HAIs) are included in this category. HACs are serious conditions that patients contract during an inpatient hospital stay. The HACs include:

- Objects Accidentally Left in the Body After Surgery (Foreign Object Retained After Surgery)
- Air Bubble in the Blood Stream (Air Embolism)
- Mismatched Blood Types (Blood Incompatibility)
- Severe Pressure Sores (Pressure Ulcer Stages III & IV)
- Falls with Injuries (Includes: Fracture, Dislocation, Intracranial Injury, Crushing Injury, Burn, Electric Shock)
- Vascular Catheter-Associated Infection
- Catheter-Associated Urinary Tract Infection (UTI)
- Signs of Uncontrolled Blood Sugar (Manifestations of Poor Glycemic Control) (HHS, 2011, (a), p.1).

Medicare doesn't pay for any of these conditions, and patients can't be billed for them if they contracted them while in the hospital. Medicare will only pay for these conditions if patients already had them when they were admitted to the hospital. The Deficit Reduction Act of 2005 (DRA) requires a quality adjustment in Medicare Severity Diagnosis Related Group (MS-DRG) payments for certain hospital-acquired conditions. CMS has titled the provision "Hospital-Acquired Conditions (HAC) and Present on Admission (POA) Indicator Reporting (HHS, 2011, (a), p. 1)

It has long been acknowledged that CAUTI is the most frequent type of infection in acute care settings. In a study that provided a national estimate of healthcare-associated infections, urinary tract infections comprised 36% of the total HAI estimate (APIC, 2008).

Beginning on October 1, 2008, CMS put into effect a new rule designed to eliminate payment for 10 preventable hospital-acquired complications including CAUTIs.

CMS selected CAUTIs as one of the 10 hospital-acquired complications due to their high cost and high volume and because they can be reasonably prevented through application of accepted evidence-based guidelines. Numerous prospective studies have examined the impact of a range of interventions (nurse and physician education, electronic reminders, nurse-driven protocols, surveillance and feedback, condom catheters, closed systems, antimicrobial catheters, etc.) in a variety of hospital settings. These studies have achieved reductions in CAUTI rates of 46% to 81% (IHI, 2011, (a), p. 1).

Leapfrog Group

The Leapfrog Group published survey results of 1,256 hospitals that found that 87% of those hospitals do not consistently follow recommendations to prevent many of the most common hospital-acquired infections (Leapfrog, 2007). If hospitals follow proper procedures using evidence-based guidelines to treat and care for patients, patients are less likely to get these conditions. The Leapfrog Group is a voluntary program aimed at mobilizing employer purchasing power to alert America's health industry that big leaps in health care safety, quality and customer value will be recognized and rewarded. This is the gold standard for comparing hospitals' performance on the national standards of safety, quality, and efficiency that are most relevant to consumers and purchasers of care. Hospitals that participate in The Leapfrog Hospital Survey achieve hospital-wide improvements that translate into millions of lives and dollars saved. Leapfrog's purchaser members use Survey results to inform their employees and to form purchasing strategies (Leapfrog, 2011).

Institute of Healthcare Improvement (IHI)

The IHI is an independent, not-for-profit-organization based in Cambridge, Massachusetts. IHI focuses on motivating and building the will for change; identifying and testing new models of care in partnership with both patients and health care professionals; and ensuring the broadest possible adoption of best practices and effective innovations. IHI was founded in the late 1980s by Don Berwick and a group of visionary individuals committed to redesigning healthcare into a system no longer plagued by errors, waste, delay, and unsustainable social and economic costs. The IHI has grown from initial grant-supported programs to become a self-sustaining organization with worldwide influence (IHI, 2011, (b), ¶1-4).

The IHI initiated both the 100,000 Lives Campaign and the 5 Million Lives Campaign, which spread *best practice* changes to thousands of hospitals through the United States, and created a national network for improvement focused on reducing needless deaths and preventing harm. The IHI Improvement Map for the “Prevention of Catheter Associated Urinary Tract Infections” was one of the initiatives that presented evidence-based practices developed from various clinicians and scientific partners such as: the Centers for Diseases Control, the Society for Healthcare Epidemiology of America, the Infectious Diseases Society of America, and the Association for Professionals in Infection Control and Epidemiology in the form of four recommendations that could be applied to all patients for the purpose of eliminating CAUTIs (IHI, 2011, (a), ¶ 7).

CMS: An Active Purchaser of Care

Ellen Griffith, CMS public affairs specialist, stated, CMS is not asking hospitals to be

guarantors against all possible adverse occurrences during a hospital stay. “It is simply asking hospitals to make sure that hospital staff does what they should be doing anyway, like washing their hands before touching a patient, or observing other sanitary precautions. The underlying rationale is that neither Medicare nor the beneficiary should pay a hospital for the higher costs of treating a condition that was acquired during the hospital stay and that was determined to be reasonably preventable through compliance with widely accepted, evidence-based guidelines” (Beaver, 2008, p. 3).

Under this new authority, Medicare has changed from a passive payer to an active purchaser of healthcare services. The use of the terms Value-Based Purchasing (VBP) or Pay for Performance (P4P) is used to describe the plans for reimbursement to healthcare organizations (HHS, 2007, p. 8). The success of this transformation is supported by and dependent upon an increasing number of widely-agreed-upon quality measures. The Medicare program has defined measures of quality in almost every setting and measures some aspect of care for almost all Medicare beneficiaries. To support this transformation, CMS has worked with stakeholders to develop and implement quality measures, making both provider and plan performance public, linking payment incentives to reporting on measures, and, ultimately, is working to link payment to actual performance on these measures (HHS, 2007, p. 9).

CMS Hospital Compare Website

In December 2002 the Department announced a partnership with several collaborators intended to promote hospital quality improvement and public reporting of hospital quality information. In July 2003 CMS began the *National Voluntary Hospital Reporting Initiative*. This

initiative is now known as the *Hospital Quality Alliance: Improving Care Through Information*, which is a public-private collaboration to improve the quality of care provided by the nation's hospitals by measuring and publicly reporting on that care. An important element of the collaboration, *Hospital Compare*, a website tool developed to publicly report credible and user-friendly information about the quality of care delivered in the nation's hospitals, debuted on April 1, 2005 (HHS, 2011, (b), ¶ 1).

CMS established a set of quality measures used to gauge how well an entity provides care to its patients. Measures are based on scientific evidence and can reflect guidelines, standards of care, or practice parameters. In this instance a quality measure converts medical information from patient records into a rate or percentage, thus allowing facilities to assess their performance. Hospitals submit quality data through the secure portion of the *QualityNet Web* site (www.QualityNet.org). Data from this initiative are used to populate the *Hospital Compare* website. Hospitals that did not submit data received a reduction in their payment update of 2.0 percentage points for Fiscal Year (FY) 2007 and beyond. For FY 2007 CMS required that hospitals submit data regarding 21 quality measures. The quality data collected included a number of infection-related measures and encompassed the following conditions: acute myocardial infarction, heart failure, pneumonia, and surgical care improvement (HHS, 2011, (c), ¶ 42).

Transparency is a broad-scale effort intended to equip consumers with quality-of-care information, helping them to make informed decisions about their health care, while encouraging institutions and clinicians to improve the quality of care provided to all patients. Transparency in healthcare facilitates improvement in performance, efficiency, and quality by providing facilities and

physicians with the additional information necessary for benchmarking. Public reporting enhances accountability in healthcare by increasing the transparency of quality data. Public reporting is designed to create both indirect financial and nonfinancial incentives to improve quality of care.

Indirect financial incentives result when public reporting drives patients' choices and, therefore, market share. Nonfinancial incentives include publicizing performance, reputation, competition, motivation, accountability, and public recognition. Providing reliable quality and cost information empowers not only patients' choices, but also the choices of stakeholders, within local and regional communities, and also nationally. Professionals are more likely to seek to join the staff of high- performing hospitals. Choice leads to incentives at all levels and motivates the entire system; improvements take place as providers compete (HHS, 2011, (c), ¶52).

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this chapter is to review the literature relevant to CAUTI outcomes in hospitals across a southeastern state. This chapter is divided into two sections. The first section discusses the genesis and the evolution of the forces that were the catalyst for Centers for Medicare and Medicaid Services *Quality Initiatives Value Based Purchasing/ Pay for Performance* in healthcare. This section includes a history, discussion of the timeline and forces that shaped the present policy. It is important to have an understanding of where we were in order to appreciate the place we are today.

The second section discusses the Donabedian Model for quality assessment, Structure, Process, and Outcomes, using this model to organize the literature review relevant to quality outcomes and catheter associated urinary tract infections.

Section: I

History

In 1965 Public Law 89-97 was created to provide healthcare coverage for the elderly and was known as Medicare. In addition, Medicaid was created to provide healthcare coverage for the indigent. The system was a cost-based reimbursement system with little oversight for the quality of care provided. In 1966 coverage began for nearly 19 million individuals. In 1972 individuals less than 65 years of age with a disability and individuals diagnosed with end stage renal disease were added as beneficiaries.

As a result of the initiation of this healthcare program groups became formed in the government to oversee the quality of the care that was rendered to the beneficiaries. In 1972 Public Law 89-97 also created PSROs (Professional Standards Review Organizations) that were established to evaluate rising use and the quality of services provided to beneficiaries. In January 1981 the Congressional Budget Office (CBO) prepared a working paper on evaluation of the PSRO's effectiveness related to cost, quality, and use. In essence the working paper found that PSROs had little or no effect either on rising use or on the quality of services provided. Thus in 1982 the PSROs were replaced with Peer Review Organizations (PRO). One emphasis of Peer Review Organizations was to monitor the quality of care provided through a retrospective individual case review. In 1990 the Institute of Medicine (IOM) conducted studies of the PRO. Recommendations from the IOM included a shift in focus from retrospective review to a more proactive approach based on quality improvement and education. Around 2005 the PROs transitioned to QIOs (Quality Improvement Organizations). The QIOs exist today with a primary focus of improving care by assisting providers in measuring quality based on clinical care guidelines.

A study was conducted by Brennan et al. (1991) for the Harvard Medical Practice to examine the reasons for the steady increase over the past decade in the number of malpractice claims brought against health care providers and in the monetary damages awarded plaintiffs. The group reviewed 30,121 randomly selected acute care, nonpsychiatric hospitals in New York State in 1984. The results showed that 3.7% of the hospitalizations and 27.6% of the adverse events were due to negligence. Although 70.5% gave rise to disability lasting less than 6 months,

2.6% caused permanently disabling injuries, and 13.6% led to death. The conclusion found a substantial amount of injury to patients from medical management, and that many injuries were the result of substandard care.

Then health care accidents fueled a growing interest in patient safety. These highly publicized accidents have occurred against a backdrop of substantial changes in the organization, delivery, and economics of health care. One such occurred on December 3, 1994, when 39 year old *Boston Globe* health reporter Betsy Lehman died from complications of an overdose of cyclophosphamide, a chemotherapeutic agent she received at the Dana-Farber Cancer Institute for treatment of breast cancer. The media intensively reported the event with 28 front-page headlines over the next three years. During those years another patient, Maureen Bateman, at Dana-Farber Cancer Institute, a world renowned facility, was also administered a cyclophosphamide overdose and suffered serious heart damage. These events devastated the two patients' families, the clinicians who cared for them, and the leaders of the health care organizations. Both errors involved breakdowns in standard processes, raised issues of trainee supervision, nursing competence, and order execution.

The nation was shocked to learn about such mistakes and people demanded to know how these errors could have happened in such a prestigious facility. The Massachusetts Department of Public Health; the Massachusetts Board of Registration responsible for licensing physicians, nurses, and pharmacists; and the Joint Commission on Accreditation of Healthcare Organizations conducted investigations of the Dana-Farber Cancer Institute. The results were widely publicized. The investigation identified numerous deficiencies including protocol violations,

ineffective drug error reporting, and oversight of quality assurance by hospital leaders.

Nationwide there are countless stories of wrong site surgeries, healthcare associated infections, and other errors which have led to untoward outcomes (Conway & Weingart, 2005).

To err is human, but many errors can be prevented. Safety is a critical first step in improving quality of care. The Harvard Medical Practice Study, a seminal research study on this issue, was published almost ten years ago; other studies have corroborated its findings, yet, few tangible actions to improve patient safety occurred. Then in 1998 the IOM Quality of Healthcare in America Committee developed a strategy that resulted in a threshold improvement in quality over the next 10 years.

The IOM was been instrumental in affecting quality improvement changes in the healthcare arena with the landmark 1999 publication: *To Err is Human: Building a Safer Health System*. The goal of this report was to break the cycle of inaction. This document set healthcare facilities on their heels in its scathing report of errors and deaths that occurred in hospitals across the country. The report estimated that up to 98,000 individuals died each year as a result of medical errors. The report linked a decrease in healthcare worker morale to patient care errors.

The report recommended that in order to reduce and/or prevent patient care errors the following must occur:

1. Establishment of a national focus to create leadership, research, tools and protocols to enhance the knowledge base about safety.
2. Identification of, and learning from, errors by developing a nationwide public mandatory reporting system, and by encouraging health care organizations and practitioners to develop and participate in voluntary reporting systems.

3. Raising performance standards and expectations for improvements in safety through the actions of oversight organizations, professional groups, and group purchasers of health care.
4. Implementation of safety systems in health care organizations to ensure safe practices at the delivery level (IOM, 1999, p. 6).

The response to the IOM report was swift and positive within both government and the private sector. Almost immediately the Clinton administration issued an executive order instructing government agencies that conduct or oversee health-care programs to implement proven techniques for reducing medical errors and created a task force to find new strategies for reducing errors. Congress soon launched a series of hearings on patient safety. In December 2000 Congress appropriated \$50 million dollars for the Agency for Healthcare Research and Quality (AHRQ) to spearhead development of ways to prevent patient care errors. The AHRQ contracted with the National Quality Forum (NQF) to create a list of “never events” that were intended to be a starting point for mandatory reporting. The conditions listed as “never events” are bedsores sometimes called pressure ulcers, injuries caused by falls, and infections resulting from the prolonged use of catheters in blood vessels or in the bladder.

This was followed by the Medicare Prescription Drug Improvement and Modernization Act of 2003, which once again called upon the IOM to work on aligning Medicare pay with provider performance. Congress, through the Deficit Reduction Act of 2005, Section 5001(b), authorized the Secretary of Health and Human Services to develop a plan to implement value-based purchasing (VBP). This was to commence Fiscal Year (FY) 2009 for Medicare subsection (d) hospitals paid under the Inpatient Prospective Payment System (IPPS). By statute, the plan

included consideration of: 1) the development and selection of measures of quality and efficiency in inpatient settings; 2) reporting, collection, and validation of quality data; 3) the structure, size, and source of value-based payment adjustments; and 4) disclosure of information on hospital performance (HHS, 2007, p. 25-27).

On August 22, 2006 President Bush issued an Executive Order, “Promoting Quality and Efficient Health Care in Federal Government Administered or Sponsored Health Care Programs,” that requires the Federal Government, to the extent permitted by law, to:

1. Ensure that Federal health care programs promote quality and efficient delivery of health care using interoperable health information technology; transparency regarding health care quality and price; and better incentives for program beneficiaries, enrollees, and providers.
2. Make relevant information available to these beneficiaries, enrollees, and providers in a readily useable manner and in collaboration with similar initiatives in the private sector and non-Federal public sector (HHS, 2007, p. 28).

In 2007 to support this mandate the Department of Health and Human Services Secretary Michael Leavitt embraced “four cornerstones” for building a value-driven health care system:

1. Connecting the health system through the use of interoperable health information technology;
2. Measuring and publishing information about quality;
3. Measuring and publishing information about price; and
4. Using incentives to promote high-quality and cost-effective care (HHS, 2007, p. 22).

Building on these four cornerstones the Centers for Medicare & Medicaid Services (CMS) articulated a vision for health care--*the right care, for every person, every time*. To

achieve this vision, CMS implemented policies to promote the delivery of care that was safe, effective, timely, patient centered, efficient, and equitable. Current Medicare hospital payment policies generally rewarded the quantity rather than the quality of care delivered and did not provide an incentive, nor support for, improving quality of care. Today, hospitals are usually paid the same for services rendered regardless of the quality of care they provide, and in some cases, hospitals may even receive additional payment for treatment of avoidable complications (HHS, 2007, p. 22).

In 2008 Medicare took the position that it would no longer pay the extra costs of treating these preventable errors, “never events”, or injuries and infections that occur in hospitals-- a move Medicare claimed could save lives and millions of dollars. “If a patient goes into the hospital with pneumonia, we don’t want them to leave with a broken arm,” said Herb B. Kuhn, acting deputy administrator of the CMS (as cited in Pear, 2007, ¶6).

This new policy to improve care purchased by Medicare, at a cost of more than \$400 billion a year, is sent ripples through the health industry. It also raises the possibility of changes in medical practice as doctors adhere more closely to clinical guidelines and hospitals perform more diagnostic tests to assess the condition of patients at the time of admission. “Hundreds of thousands of people suffer needlessly from preventable hospital infections and medical errors every year,” McGiffert, health analyst for Consumers Union Policy & Action from Consumer Reports said. “Medicare is using its clout to improve care and keep patients safe. It’s forcing hospitals to face this problem in a way they never have before” (as cited in Pear, 2007, ¶15). Hospital executives worried they would have to absorb the costs of these extra tests

because Medicare generally pays a flat amount for each case. These steps taken by CMS strengthened the tie between the quality of care provided to Medicare beneficiaries and payment for the services provided when they are in the hospital, thus the term *Value Based Purchasing Program* was introduced (Agency for Healthcare Reach and Policy, 2007, p. 1).

Value-based purchasing (VBP) or pay for performance (P4P), which links payment more directly to performance, is a key policy mechanism that would transform Medicare from a passive payer for services to an active purchaser of care for millions of Medicare beneficiaries. CMS would focus on purchasing value for the Medicare program, which means that hospitals would receive differential payments depending on their performance. VBP is a key policy mechanism to achieve desired programmatic goals:

1. Improve clinical quality
2. Address problems of underuse, overuse, and misuse of services
3. Encourage patient-centered care
4. Reduce adverse events and improve patient safety
5. Avoid unnecessary costs in the delivery of care
6. Stimulate investments in structural components and the re-engineering of care processes system-wide
7. Make performance results transparent to and useable by consumers
8. Avoid creating additional disparities in health care and work to reduce existing disparities (Agency for Healthcare Reach and Policy, 2007, p. 1).

So in summary, the elements of this program are:

1. A hospital must submit data for all VBP measures that apply to its patient population and service mix.

2. The measures could be used for incentive payment, public reporting, or measure development.
3. A hospital receives a performance score on each measure for incentive payment for which it has a minimum number of cases
4. Outcome measures are grouped into *domains* e.g. clinical process-of-care measures, HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) patient perspectives of care survey, efficiency measures--and a score is calculated for each domain by combining the measure scores within that domain, weighting each measure equally. The score reflects the percentage of points earned out of the total possible points for which a hospital is eligible.
5. A hospital's VBP Total Performance Score is determined by aggregating the scores across all domains. Domains could be weighted equally or unequally.
6. The Total Performance Score is translated into the percentage of VBP incentive payment earned using an *exchange function*, which aligns payments with desired policy goals (HHS, 2007, p. 53).

Pay for performance provides an immediate opportunity for encouraging the most rapid feasible performance improvements by all providers, supports innovative and constructive change throughout the health system, and promotes better outcomes of care for the patients. Because these mechanisms are a relatively new concept, close monitoring will be necessary for any adverse consequences (Bodrock & Mion, 2008).

As the Value Based Purchasing Program rolled out, organizations were developing programs to assist hospitals in preparing for the changes in reimbursement that were scheduled to occur in October 2008. One such organization was the Institute for Healthcare Improvement (IHI) an independent not-for-profit organization helping to lead the improvement of health care throughout the world. Founded in 1991 and based in Cambridge, Massachusetts, IHI works to accelerate improvement by building the will for change, cultivates promising concepts for

improving patient care, and helps health care systems put those ideas into action.

The IHI beliefs are that all improvements require change but not all change is improvement. Knowing the differences between good changes and ineffective ones require intellectual discipline and honesty based a foundation of evidence, facts, and science. The IHI is focusing on an ambitious set of goals adapted from the Institute of Medicine's six improvement aims, sometimes called planks, for the health care system: Safety, Effectiveness, Patient-Centeredness, Timeliness, Efficiency, and Equity. The IHI called this list the *No Needless List*:

1. No needless deaths
2. No needless pain or suffering
3. No helplessness in those served or serving
4. No unwanted waiting
5. No waste
6. No one left out (IHI, 2012, (c), p. 5).

IHI works with health professionals throughout the world to accelerate the measurable and continual progress of health care systems toward these bold objectives that leads to breakthrough improvements that is truly meaningful in the lives of patients. Best practices in health care, whether they emerge from formal research or from the practical experiences of innovators, often spread far more slowly than they should. The IHI aims to get research into practice as quickly as possible to ensure that every patient receives care based on the best possible knowledge base (IHI, 2012, (c), p. 5). The IHI and its scientific partners work closely together through the use of a combination of evidence-based interventions based on empirical

evidence to develop guidelines or toolkits for the healthcare facility implementation (IHI, 2012, (c), p. 5).

The first initiative since adopting the IOM six areas for improvement was the *100,000 Lives Campaign* introduced in December 2004 by the Institute for Healthcare Improvement (IHI) aimed at avoiding 100,000 hospital deaths "over the next 18 months and every year thereafter" (IHI, 2012, (c), p. 5). The idea underlying the campaign was that if six evidence-based proven interventions were reliably implemented in enough U.S. hospitals, 100,000 fewer patients would die each year (IHI, 2012, (c), p. 5).

Endorsing the campaign immediately was an impressive array of organizations including the American Medical Association (AMA), the American Nurses Association (ANA), the Centers for Medicare and Medicaid Services (CMS), the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the Agency for Healthcare Research and Quality (AHRQ), the Association of American Medical Colleges (AAMC), a large number of quality improvement organizations, state hospital associations, and other prominent associations and institutions (Gosfield & Reinertsen, 2005).

By IHI's count, within 5 months after the campaign was announced, 2,300 of the nation's 6,000 hospitals had enrolled, constituting more than half of the hospital beds in the United States. As a result of the *100,000 Lives Campaign*, the six campaign interventions have become national standards of care. The campaign was so successful that it created the potential of liability for hospitals that ignored the campaign or failed to implement its planks (Gosfield & Reinertsen, 2005).

The IHI again challenged the healthcare industry to raise quality through its next initiative *5 Million Lives Campaign* that builds on the original campaign but added six other aspects of care for healthcare facilities:

1. Prevent harm from high-alert medicine
2. Prevent methicillian-resistant *Staphylococcus Aureus* (MRSA) infections
3. Prevent pressure ulcers
4. Reduce surgical complications
5. Reduce readmissions for patients with congestive heart failure
6. Involvement of the board of directors (IHI, 2012, (c), p. 1).

A number of influential national partners stood by IHI with its well-aligned programs including The Joint Commission, the American Nurses Association, the American Medical Association, the Centers for Medicare & Medicaid Services, the Centers for Disease Control and Prevention, the National Patient Safety Foundation, and the Leapfrog Group (McGannon, Hackbarth, & Griffin, 2007). This campaign officially ended in December 2008 and the results were so successful that the initiatives became a standard of practice in the healthcare industry.

The IHI's next frontier of hospital work is the *IHI Improvement Map*. Building on many years of hard work in hospitals and the momentum of the *100,000 Lives* and *5 Million Lives Campaigns*, IHI then focused on an essential set of process improvements designed to achieve high levels of performance in areas that matter most to patients. The *Improvement Map* will help make sense of many complex and competing demands hospitals face, to find reliable routes to success and improve patient care by focusing on an essential set of processes needed to

achieve the highest levels of performance in areas that matter most to patients (IHI, 2011,(d), p. 1).

As of October 1, 2008, CMS would no longer reimburse hospitals for catheter associated urinary tract infections (CAUTI), included on the CMS list of preventable harms caused by medical care. CAUTI is a Healthcare Acquired Infections (HAI) and is included on that list because they are considered a clinical indicator of quality of care. CAUTIs are high volume, high cost health care problems with acceptable evidence-based prevention strategies. CAUTIs are considered an avoidable complication, and unless patients had their infections at the time of hospital admission, CAUTIs were considered secondary costs that would not be reimbursed by CMS (Elpern et al., 2009).

As part of this new frontier the IHI has published an Improvement Map, *Getting Started Kit: Prevent Catheter-Associated Urinary Tract Infections*, which outlines four components of care in reducing catheter associated urinary tract infections. These components were based on the most current evidenced-based recommendations from the *Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals* published in 2008 by The Society for Healthcare Epidemiology of America and the Infectious Diseases Society of America (SHEA-IDSA) in partnership with The Joint Commission, Association for Professionals in Infection Control and Epidemiology (APIC), and the American Hospital Association (AHA).

The four components are:

1. Avoid unnecessary urinary catheters
2. Insert urinary catheters using sterile techniques

3. Maintain urinary catheters based on recommended guidelines
4. Review urinary catheter necessity daily against criteria (IHI, 2011, (a), p. 1).

This is an important tool to be used by the hospitals in the fight to eliminate CAUTIs.

The urethral catheter has been in use as a medical device for many years (Warren, 1997). From the development by Foley of the first balloon-inflating device in the 1920s to the evolution of the *closed* drainage systems in the 1950s and 1960s, the urinary catheter today is one of the most widely used pieces of medical apparatus. Although precise numbers are not available it is believed that as many as one in four hospitalized patients receive an indwelling urinary catheter. It has been estimated that up to 50% of these urinary catheters are unnecessarily placed. An even higher rate of urinary catheter use has been documented in the perioperative period. As many as 86% of patients undergoing major surgery have urinary catheters of which half of these catheters remain in place for more than 2 days. This poses a greater risk to the patient because they are twice as likely to develop CAUTI which can complicate the early assessment, identification, and treatment of other postoperative infections delaying recovery (Elvy & Colville, 2008; Shapiro, Simchen, Izraelli, & Sacks, 1984; Warren, 1997).

This campaign hopes to bring about a sea of change in national improvement and to challenge current expectations of what is possible. The IHI together with complementary partner initiatives will enable this campaign to act as a major driver of national improvement creating a lasting legacy of collaboration, learning, and optimism about what is possible, and establishes a new direction for healthcare quality (McGannon, Hackbarth, & Griffin, 2007). These four components have been implemented across the country in an effort to reduce or eliminate

CAUTIs.

In summary, the road to improve healthcare quality has been long and arduous; the evolution of improving the quality of healthcare is ongoing. The general model of the influence of the external environment on quality is described by the IOM (1999, p. 18):

1. External drivers that consist of two categories that influence quality improvement which are regulation and legislation, and economic and other incentives such as actions by purchasers and consumers or professional and community values (Publicly Reporting Quality Scores)
2. Safety which requires freedom from injury and will require a larger role for regulation and oversight authority
3. Practice consistent with current medical knowledge that will include best practices, incorporating evidence-based medicine
4. Customization that requires meeting customer-specific values and expectations. This requires a larger role for creative, continuous improvement and innovation with organizations and marketplace rewards (Pay for Performance) (IOM, 1999, p. 18).

These external forces will influence how care is delivered in America's Hospitals and its effect on how we handle CAUTIs are described in Section II using Donabedian's Model for Quality Assessment.

Section II

This section of literature review describes the Donabedian Model of Quality Assessment, Structure, Process, and Outcome. In addition literature pertaining to catheter associated urinary tract infections rates categorized under Donabedian's Model of Structure, Process, and Outcome is discussed.

Model

The descriptors for each facility were based on the framework of the conceptual model

developed by Avedis Donabedian for assessing the quality of care: Structure-Process-Outcome. Avedis Donabedian is known as the *father of quality assurance*; he wrote 11 books and over 100 articles. His 1966 article, “Evaluating the quality of medical care,” published in the *Milbank Memorial Fund Quarterly*, introduced the concept of dividing quality of healthcare measures into structure, process, and outcome, which remains, even now, the dominant paradigm for the evaluation of the quality of healthcare (Frenk, 2000).

Donabedian’s three volume book set on the *Explorations in quality assessment and monitoring* (1980–1985) is a monumental contribution to healthcare quality. Donabedian’s three approaches for assessing quality of care are not attributes of quality but are, instead, three types of information one can obtain to infer whether quality is good. This three-part approach to quality assessment is possible only because good structure increases the likelihood of good process, and good process increases the likelihood of a good outcome (Donabedian, 1988, 2003).

By using Donabedian’s framework of Structure, Process, and Outcome in this study I examined various hospitals in a southeastern state. Hospital characteristics (structure) were described. Next, the study examined whether each hospital used the Institute of Healthcare Improvement (IHI)’s four recommendations (processes) to reduce and eliminate CAUTIs. Finally, the study reported the data publicly reported on CMS Hospital Compare Web Site (outcomes).

The structure-process-outcome model was developed by Avedis Donabedian to assess clinical practice. The structure aspect designates the conditions under which care is provided.

These include:

1. Material resources such as facilities and equipment.
2. Human resources such as the number, variety, and qualifications of the professional and support staff.
3. Organizational characteristics such as the organization of the medical and nursing staff and the presence of teaching and research functions (Donabedian, 2003, p. 46)

The process element is the activities that constitute healthcare, which includes the treatment, the prevention, and the patient education carried out by professional personnel. The outcome describes the changes (desirable or undesirable) in individuals and populations.

These are classified under the following categories: clinical, physiological, physical, psychological, social, integrative, and evaluative. This study focuses on the evaluative outcomes that demonstrate the effectiveness of certain processes of care on the outcomes (Donabedian, 2003).

Avedis Donabedian succinctly penned the lofty aspirations for which we must constantly strive;

“The criteria of quality assessment are more precise representations of bright, though nebulous, images of quality to which we all aspire, and the bridge that connects the grand abstractions, with the actual business of passing judgment on the quality of care in any particular instance” (1982, p. 3).

Donabedian’s model is displayed in Figure 1 using the elements from research questions categorized under structure-process-outcome format.

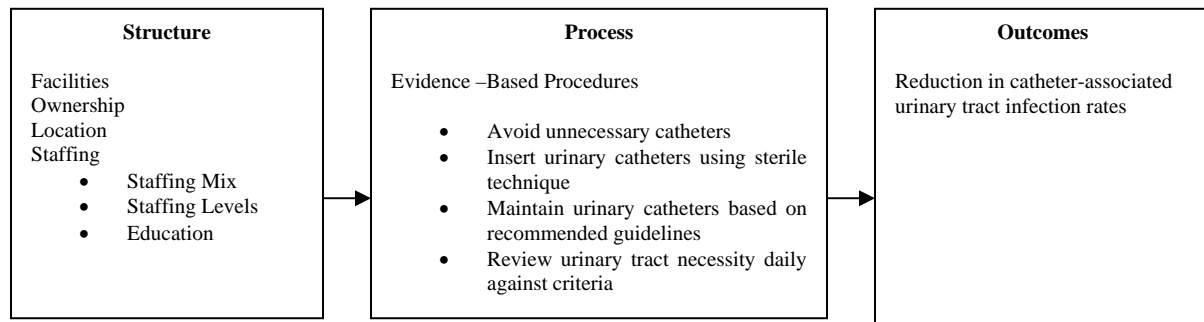
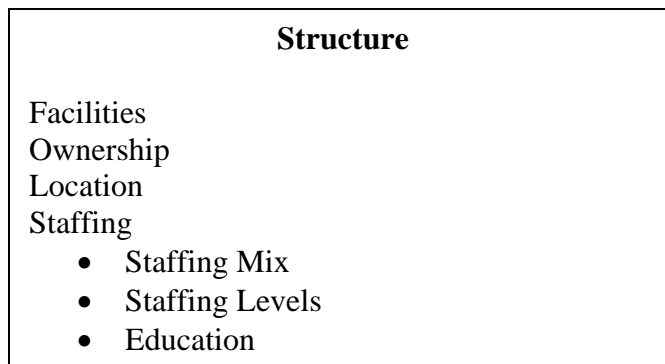


Figure 1. Donabedian’s Model for Quality Assurance. Adapted from Donabedian, 2003.

Donabedian’s seminal paper of 1966, *Evaluating Quality of Medical Care*, introduced the concepts of structure, process, and outcome, which remain to our day as the dominant paradigm for the evaluation of the quality of health care. An indicator of the importance of this paper is the fact that it is one of the very few *Citation Classics* in the field of health systems research. As a result of Donabedian’s work, the field of health systems research has become a robust space for inquiry and an exciting arena for action, focusing on the quality of health care. In order to assess whether quality of care has been good, fair, or poor, Donabedian suggested using these three approaches (structure, process, and outcome) as the triad of quality (Donabedian, 1966; Frenk, 2000). To further examine this model each segment will be discussed separately presenting research associated with catheter-associated urinary tract infection rates and quality outcomes.

The next segment discusses structure and Figure 2 displays the elements that are in the research questions under this category.

Structure



. *Figure 2.* Structure. Adapted from Donabedian, 2003.

Donabedian defines structure as the relatively stable characteristics of the providers of care, of the tools and resources they have at their disposal, and of the physical and organizational settings in which they work. The concept of structure includes the human, physical, and financial resources that are needed to provide medical care. The term embraces the number, distribution, and qualifications of professional personnel, and so, too, the number, size, equipment, and geographic disposition of hospitals and other facilities. Structure is generally seen as the way a health care system is set up. This has an important bearing on how persons in the system behave and consequently on the quality of care offered and enjoyed. The basic characteristics of structure are that it is relatively stable, that it functions to produce care or is a feature of the environment of care, and that it influences the kind of care that is provided. The use of structure as an indirect measure of the quality of care depends on the nature of its influence on care.

Donabedian wrote that good structure, that is, a sufficiency of resources and proper system design, is probably the most important means of protecting and promoting the quality of care. Donabedian, if alive today, would not recognize the foundation of quality healthcare as it is

defined today.

Over the last 2 decades substantial changes have been made in health care organizations and in the delivery of health care. These fast-paced changes have resulted from multiple, concurrent events, including: 1) Pay for Performance that contains major modifications in the ways in which government and private health insurance programs reimburse health care providers (including hospitals, nursing homes, home health care agencies, and individual practitioners); 2) cost-containment efforts of health care organizations (HCOs) in response to these changes in reimbursement; 3) growth in, and increased demand for, new health care technologies; and 4) changes in the health care workforce. The first question to be addressed is the question of ownership.

The issue of differential quality in for-profit (FP) and not-for-profit (NFP) hospitals remain a critical health policy question. In the early to mid-1990s acute care hospitals were buffeted by dramatic changes in their operating environments because of the increasing dominance of managed care, market responses to industry overcapacity, more stringent Medicare reimbursement policy, new technology development, and demands for shorter lengths of stay. Hospitals reacted by introducing a range of strategies aimed at improving the efficiency of their internal operations.

A literature review was conducted regarding the question of hospital ownership and quality outcomes. Studies revealed a substantial but inconclusive body of research on quality differences in for-profit and not-for-profit hospitals. Inconclusiveness of the research is due to conceptual and methodological diversity in the use of disparate clinical conditions, risk models,

selection of outcomes and the timing of their measurement, data sets, and analytic approaches relying on widely varying assumptions contribute to the lack of clarity on the issue (Mark & Harless, 2007; Sloan, Picone, Taylor, & Chou, 2001).

In 2008 Eggleston, Shen, Lau, Schmid, and Chan conducted a systematic review that identified 31 observational studies written in English since 1990 that used multivariate analysis to examine quality of care at nonfederal general, acute, short stay United States hospitals. Metaregression revealed that estimates of the relationship between hospital ownership and adverse patient outcomes differ systematically according to a study's data source, time period examined, and region covered. Studies representative of the United States as a whole tend to find lower quality among the for-profit than private nonprofits.

HCOs have responded in a variety of ways that, in turn, have affected the work and the work environment of nurses. Some of these changes have resulted, for example, in greater numbers of more acutely ill and technology-dependent patients being assigned to individual nurses; changes in how licensed and unlicensed nursing staffs are deployed; and a growing number of competing demands on nurses' time, such as increased paperwork and documentation requirements. Many individuals and organizations have expressed concern that these and other changes have adversely affected nurses' ability to provide safe patient care (Aiken et al., 2001; Institute of Medicine, 1999; Satterly, 2004; Shindul-Rothschild, Berry, & Long-Middleton, 1996).

As the largest healthcare occupation, registered nurses held about 2.6 million jobs in 2008. Hospitals employed 60% of RNs. About 8% of RN jobs were in offices of physicians, 5%

in home healthcare services, 5% in nursing care facilities, and 3% in employment services. The remainder of RNs worked mostly in government agencies, social assistance agencies, and educational services (United States Department of Labor, undated).

Nursing care is central to preventing poor outcomes and ensuring optimal outcomes in many different sectors of the health care system. Historically, the economic value that nursing brought to the patient care process was not recognized nor quantified. Improving the quality of nursing care through work environment changes or increases in staffing is viewed by many as an added cost, but the benefits in terms of money saved through improved nursing satisfaction and patient outcomes were not considered. Nursing has been considered a cost rather than a revenue, which makes nursing a target for cost reductions. Policies such as hospital reimbursement affect nurse supply, demand, workload, and retention but are generally made without consideration of workforce impact. Because institutions are not directly compensated for providing nursing care, unlike physician services, there is little motivation for providing the right “dose” of nursing to meet patients’ varying needs (Aiken et al., 2008).

A study conducted to determine the association between the patient-to-nurse ratio and patient mortality, failure to rescue among surgical patients, and factors related to nurse retention yielded two insightful conclusions. In hospitals with higher patient-to-nurse ratios, surgical patients experienced higher risk-adjusted 30-day mortality and failure-to-rescue rates, and nurses were more likely to experience burnout and job dissatisfaction (Aiken, Clarke, Sloane, Sochalski & Silber, 2002). Because of the key role nurses play in patient safety and quality of care, the U.S. Department of Health and Human Services (DHHS) and the Agency for Healthcare

Research and Quality (AHRQ) conducted a review of 96 studies to examine the association between nurse staffing and patient outcomes. Results showed that the work environment was a major threat to safe nursing practice in hospitals. Higher registered nurse staffing was associated with less hospital-related mortality, failure to rescue, cardiac arrest, hospital acquired pneumonia, and other adverse events. The effect of increased registered nurse staffing on patient's safety was strong and consistent in intensive care units and in surgical patients. Greater registered nurse hours spent on direct patient care were associated with decreased risk of hospital-related death and shorter lengths of stay.

Limited evidence suggests that the higher proportion of registered nurses with BSN degrees was associated with lower mortality and failure to rescue. More overtime hours were associated with an increase in hospital related mortality, nosocomial infections, shock, and bloodstream infections. No studies directly examined the factors that influence nurse staffing policy. Few studies addressed the role of agency staff. No studies evaluated the role of internationally educated nurse staffing policies (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007).

Hospital restructuring in the last 2 decades, in response to the advent of managed care, resulted in shorter hospitalizations of acutely ill patients to increase hospitals' efficiency and financial performance. Increased patient turnover placed new stresses on nurses to provide safe patient care. The RN had increased workload, when 23% of hospitals reported 7-12 patients per nurse in most medical-surgical units. This inflamed nurses' distrust in hospital and nursing administration, as well as reduced nurse autonomy (Kane et al., 2007). At least part of

the growing nurse shortage from 6% in 2000 to a projected 20% in 2020 can be traced to nurse job dissatisfaction. A nurse shortage, in combination with increased workload, has the potential to threaten quality of care. Hospitals with inadequate nurse staffing have higher rates of adverse events such as hospital acquired infection, shock, and failure to rescue (Kane et al., 2007).

The Economics of Nursing Invitational Conference: Paying for Quality Nursing Care, sponsored by the Robert Wood Johnson Foundation and the Rutgers Center for State Health Policy, was held at the Robert Wood Johnson Foundation in Princeton, N.J., June 13-14, 2007. The economics of paying for quality nursing care were addressed in a series of high-level sessions and a call to action. Delivering the keynote address at the conference was Linda Aiken, Ph.D., F.A.A.N., F.R.C.N., R.N., from the Center for Health Outcomes and Policy Research, University of Pennsylvania, recommended that further research needs to be conducted to determine the impact of policy and payment changes on the nursing workforce and quality of care. She advocated education and motivation of health care leaders to act on the basis of evidence in their management decisions. Also attending this conference was Dr. Sean Clarke (Associate Director, Center for Health Outcomes and Policy Research, University of Pennsylvania) who discussed the challenge of meeting safety and quality targets during a nursing shortage, and with hospital financial constraints, noted that there is a possibility for a downward spiral in quality for agencies on the edge. Lower reimbursements could lead to even more limited resources and poorer quality of care, with even lower reimbursements. Value Based Purchasing (VBP) and Pay for Performance (P4P) quality indicators tend to be narrow process indicators that don't capture the real quality of care, especially nursing care. Hospitals can "perform to the

indicators” rather than improve quality, and the documentation burdens for nurses could go up (Unruh, Hassmiller, & Reinhard, 2008). Significant gaps remain in nursing outcomes research literature. These gaps need to be addressed to strengthen the case for including nursing quality indicators in public reporting and value-based purchasing initiatives and to provide guidance to nurse executives regarding staffing models (Dunton, Gajewski, Klaus, & Pierson, 2007).

Will the effect of these initiatives be as significant as the Balanced Budget Act (BBA) of 1997, where Medicare reduced the payments health care providers received, when the phrases reorganization, restructuring, downsizing were all terms used to describe that nurses were doing more work with less people? The practice of wearing of many hats has continued to this day in some facilities even though the BBA initiatives were reversed over the years. For the experienced nurse who lived through the BBA and its effects, the prospect of the new pay for performance with financial incentives tied to the outcomes of patient care is frightening. It is well documented that nursing, especially the Registered Nurses salaries’, is a large portion of the hospital budget. When profit margins start to drop, one of the first places that is considered to be reduced is usually the nursing budget due its size and cost.

The next segment is process; Figure 3 lists the components from research questions that are addressed under this section of the model.

Process

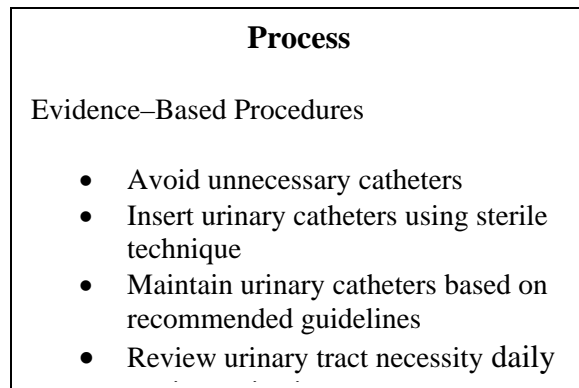


Figure 3. Process. Adapted from Donabedian, 2003.

Donabedian (2003) defines process as the activities that constitute health care including diagnosis, treatment, rehabilitation, prevention, and patient education usually carried out by professional personnel. The processes discussed in relation to CAUTIs in this section are designated by the IHI (2011, (a), p. 1) as evidence based practice recommendations to reduce or eliminate urinary tract infections.

According to Poilt and Beck (2012) evidence-based practice (EBP) is the conscientious use of current best evidence in making clinical decisions about patient care. It is a clinical problem solving strategy that de-emphasizes decision making based on custom using the integration of research evidence with clinical expertise and patient preferences. Evidence-based practice is currently being adopted and practiced in nursing. The achievement of evidence-based nursing practice depends on a research-based body of knowledge. The results from these individual studies contribute to a body of evidence, which in turn provides a foundation for clinical practice guidelines and clinical performance measures (Coopey, Nix, & Clancy, 2006).

Best practice protocols exist currently to decrease the risk and incidence of CAUTIs which is the most common, costly, and believed to be 'reasonably preventable' hospital-acquired infection according to CMS. Infection control experts have predicated hospitals that implement these initiatives can reduce their local rate of catheter use and secondarily reduce the overall number of CAUTIs by at least 50% (Fuchs, Sexton, Thornlow, & Champagne, 2011). Among all the methods that have been investigated, the most important intervention is limiting catheter use (Elpern et al., 2009). In the United States, up to 5 million urinary catheters are placed annually. Between 12% and 25% of all hospitalized patients will receive a urinary catheter during their hospital stay, with as many as half not having an appropriate indication (IHI, 2011, (a), p. 1). The appropriate indications for indwelling urethral catheter use have been established by several groups: the Healthcare Infection Control Practices Advisory Committee (HICPAC) (2009), and The Society for Healthcare Epidemiology of America, (SHEA) (2008). The following indications are:

1. Perioperative use for selected surgical procedures
2. Urine output monitoring in critically ill patients
3. Management of acute urinary retention and urinary obstruction
4. Assistance in pressure ulcer healing for incontinent patients
5. As an exception, at patient request to improve comfort or for comfort during end of life care (HICPAC, 2009, p. 11; SHEA, 2008, ¶16).

The Joint Commission established *National Patient Safety Goal (NPSG) 07.06.01*:
Implement evidence-based practices to prevent indwelling catheter associated urinary tract

infections was effective January 1, 2012. It was based on the recommendations from previous aforementioned groups that clearly outlines that a facility must have processes in place to limit the use of indwelling catheters and assess each patient's case against the indications prior to insertion (TJC, 2012, (a), p. 16).

The second recommendation from IHI (2011)(a) is to insert catheters using aseptic technique to reduce the risk of a CAUTI, accepting the fact that some patients will require the use of an indwelling catheter. Greater than 80% of all patients who develop UTI during hospitalization have a urinary catheter. There are two primary sources of CAUTIs, both of which are related to the use of indwelling urinary catheters: external bacterial ascension and internal bacterial ascension. External bacterial ascension occurs when microorganisms colonize the external catheter surface, such as catheter placement in the absence of aseptic technique. Therefore it is essential that the catheter is inserted only by trained personnel following aseptic technique (Rebmann & Greene, 2010; Saint et al., 2008). Internal bacterial ascension occurs when pathogens are introduced into the urinary drainage system, such as when obtaining a urine sample. Pathogens can colonize a patient's bladder within 3 days after the catheter becomes colonized. Endogenous intestinal flora, improperly decontaminated equipment, poor health care worker hand hygiene practices, and common skin bacteria can all contribute to CAUTI.

Both SHEA (2008) and HICPAC (2009) recommend the following basic elements for insertion:

1. Use appropriate hand hygiene practice immediately before the insertion of the catheter.
2. Insert catheters using aseptic technique and sterile equipment

- a. gloves, a drape, and sponge
 - b. sterile or antiseptic solution for cleaning the urethral meatus
 - c. single-use packet of sterile lubricant jelly for insertion
3. Use as small a catheter as possible that is consistent with proper drainage, to minimize urethral trauma.

The third recommendation is to maintain catheters based on recommended guidelines in which consistency is the key process. The evidence in this area is well defined, with consensus across the clinical expert organizations HICPAC (2009) and SHEA (2008). The challenge at the hospital front line is designing processes so that adequate maintenance occurs reliably for every patient, every day, every shift, and every clinical caregiver. Appropriate hand hygiene practices are a basic standard of care and should be followed before and after any patient care activity. Standard precautions, including gloves, should be used during manipulation of the catheter site or apparatus (HICPAC, 2009; IHI 2011(a), p. 1; WHO 2009). Routine maintenance includes the following processes:

1. Routine maintenance
 - a. Maintain a sterile, continuously closed drainage system
 - b. Keep the catheter properly secured to prevent movement and urethral traction
 - c. Keep collection bag below the level of the bladder at all times maintain unobstructed urine flow
 - d. Empty collection regularly, using a separate collecting container for each patient, and avoiding allowing the drainage spigot to touch the collecting container.

The five maintenance processes should be verified and documented at least once per shift. This is the minimal requirement for documentation; each organization should decide the

interval for its staff and follow compliance with surveillance. Educating all staff and physicians about practices that should occur and their frequency of documentation would be the fundamental first step in implementing a successful CAUTI prevention program (IHI, 2011, (a), p. 1).

The fourth recommendation requires a review of urinary catheter necessity daily and to remove promptly (HICPAC, 2009; IHI, 2011(a); SHEA, 2008). The duration of catheterization is the most important factor for the actual development of infection; the numbers are greater than 3% to 7% likelihood of developing a CAUTI the longer the catheter remains in. If the use of an indwelling catheter is necessary, the most important strategy is removing the catheter as soon as possible. This strategy has been well documented in research over the past 30 years (Garibaldi, Burke, Dickman, & Smith, 1974; Huang et al., 2004; Lo et al., 2008; Platt, Polk, Murdock, & Rosner, 1986; Saint & Lipsky, 1999).

Regular review of catheter necessity is recommended by SHEA (2009) as a special approach to reduce CAUTIs. It is a necessity for organizations striving for “getting to zero” and should be conducted for all patients with urinary catheters using the same criteria for appropriate insertion. The daily review may include processes such as:

1. Automatic stop orders
2. Mandatory renewal orders that include documentation of indication
3. Standardized reminders in patient records, or alerts in computerized ordering systems

Despite the significance of this risk factor, in a survey of hospitals Saint et al. (2008), found that 74% of respondents did not monitor catheter duration, and necessity for continuation

was not addressed. These simple daily review strategies eliminate one of the most unreliable factors in human behavior, reliance on memory (Cornia, Amory, Fraser, & Lipsy, 2003; Saint et al., 2002).

Outcomes is discussed next, Figure 4 displays the element that will be addressed by the research questions.

Outcomes

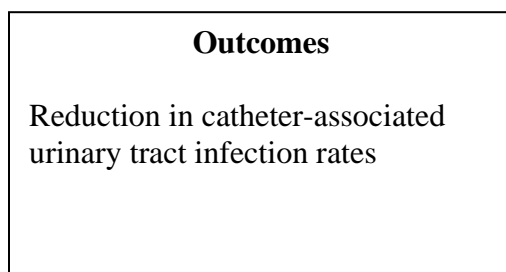


Figure 4. Outcomes. Adapted from Donabedin, 2003.

Donabedian defines outcome to mean changes (desirable or undesirable) in individuals and populations that can be attributed to prior or concurrent health care. The merits of measuring outcomes as compared to process as a means for assessing quality of care is that it can be asserted that what matters most is the effect of the care on the patient's health and well being (Donabedian, 2003). CAUTIs are considered a clinical indicator of quality of care and are listed as largely preventable by CMS (Elpern et al., 2009).

The impact of external factors is very relevant to an organization's decisions and interventions regarding healthcare associated infections including CAUTIs. Agencies such as the CDC, National Quality Forum (NQF), Agency for Healthcare Research and Quality (AHRQ), and the Institute of Medicine (IOM) have been focusing on ways to improve the outcomes of

care for patients. The Medicare program, which represents the largest healthcare insurance program in the United States, has generally paid for services for patients without regard to outcome.

As of October 1, 2008 CMS changed their reimbursement rules to exclude payment for healthcare associated infections, CAUTIs are included. Strategies have been developed to reduce or eliminate the healthcare associated infections. It is the role of the infection control preventionist (ICP) to lead the efforts in their respective organizations to reduce the incidence of CAUTIs through policy and process changes. In order to expedite these changes the ICP must be the subject matter expert, perform surveillance data and risk assessment, consult on infection control interventions, and facilitate CAUTI related improvement projects.

The outcome of the improvement projects will be accomplished through monitoring and reporting of the results of interventions on a consistent basis, and instituting additional improvements when appropriate based on the surveillance data.

The method for monitoring the outcomes of the interventions will be accomplished using a two fold-method:

1. Measurement of Process Measures
 - a. Compliance with hand hygiene
 - b. Compliance with educational program
 - c. Compliance with documentation of catheter insertion and removal
 - d. Compliance with documentation of indications for catheter placement
 - e. Compliance with documentation of catheter maintenance

2. Measurement: Recommended Outcome Measures Metrics

- a. Number of CAUTI per 1000 catheter-days
- b. Number of BSI secondary to CAUTI per 1000 catheter-days
- c. Catheter utilization ratio (urinary catheter-days/patient-days) x 100 (CMS, 2008).

Summary

Research indicates that CAUTIs are the most frequent HAIs and the most preventable. Chapter 2 has detailed the history of the “Pay for Performance” initiatives, the theoretical choice for the Donabedian model used for systematically assessing these factors relating to CAUTIs, and the research for the reduction and the elimination of CAUTIs using the recommendations of the IHI. The purpose of this chapter has been to demonstrate inferences using evidence based practices as it pertains to the relationship among the three approaches (structure, process, and outcome), therefore structure influences process, and process influences outcomes. Chapter 3 describes the methodology used in order to study CAUTI outcomes in acute care hospitals in a southeastern state as it compares their structures and processes.

CHAPTER 3

METHODOLOGY

Introduction

This chapter presents the methods used in this descriptive study. It includes a discussion of the research design, framework, selection of the participants, delimitations and limitations, instrumentation, protection of human subjects, data collection, data analysis, and data maintenance of quality and integrity.

Research Design

The research methodology chosen for this study is a descriptive design. This method is used to gain more information about characteristics of a phenomenon within a particular field of study. The purpose is to provide a picture of situations as they naturally happen. A descriptive design may be used to develop theory, identify problems with current practice, justify current practice, make judgments, or determine what others in similar situations are doing (Burns & Grove, 2009). The simple descriptive design as defined by Waltz and Bausell, (1983) is used to: 1) supply accurate comprehensive information that details current phenomena, 2) identify issues with current conditions and practices, 3) provide rationale for current conditions and practice efficacies, 4) form a foundation for making judgments, and/or 5) determine what others are doing with similar problems or situations, and allow the researcher to benefit from their experiences in making future plans or decisions regarding development of standards of practice.

No manipulation of variables is involved and dependent and independent variables should not be used because the design involves no attempt to establish causality (Burns & Grove, 2009; Polit & Beck, 2012; Waltz & Bausell, 1983).

The purpose of the study is to describe the strategies used by southeastern hospitals to reduce CAUTIs and compare the outcomes by hospital structure and processes used. The study compares the hospital aspects of structures that include rural and urban settings, profit and nonprofit status, and fewer than 100 beds and 100 or more beds. Hospital demographics include RN/LPN staff ratio, unfilled nursing positions, educational preparation of RNs, educational preparation of the Infection Control Preventionists (ICP), and the number of years each ICP has spent on the job.

The *processes* examined are any measures used by hospitals in a southeastern state to reduce CAUTI rates. These might include implementing the four recommendations from the Institute Healthcare Improvement to reduce and/or eliminate CAUTIs:

- 1) avoid unnecessary urinary catheters,
- 2) insert urinary catheters using aseptic technique,
- 3) maintain urinary catheters based on recommended guidelines,
- 4) review urinary catheter necessity daily and remove promptly (IHI, 2011, (a), p. 1).

Infection Control Preventionists were queried to determine if evidence-based recommendations were implemented at their hospitals. If so, what educational preparation was given to the nursing and medical staff, and by whom; was there a change in the CAUTIs rates

since the evidence-based recommendations were implemented; and did they track their CAUTI rates prior to the CMS's 2008 "Pay for Performance" initiative.

Framework

The IOM in 1990 defined *quality* of care as, "The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (IOM, 1990, p. 21). The basic premise of Value Based Purchasing, or Pay for Performance, is to improve healthcare quality.

The most-noted model to date used in this study was developed by Avedis Donabedian for the purpose of assessing the quality of care. The model consists of three components: Structure-Process-Outcome (Donabedian, 1982, p. 79; 2003, p. 46). The first of the three components in this model is structure, which Donabedian defines it as the conditions under which care is provided. These include:

1. Material resources such as facilities and equipment
2. Human resources, such as the number and the variety, and qualifications of professional and support personnel
3. Organizational characteristics, such as the organization of the medical staff and nursing staff, the presence of teaching and research functions, kinds of supervision and performance review, methods of paying for care (Donabedian, 2003, p. 46).

The process component of this model is defined as the activities that constitute healthcare, including diagnosis, treatment, rehabilitation, prevention, and patient education. These are usually carried out by professional personnel but also include other contributions to care, particularly by patients and their families (Donabedian, 1982, p. 80; 2003, p. 46).

Outcome are defined by Donabedin, (1982, p. 81; 2003, p. 47) as the changes (desirable or undesirable) in individuals and populations that can be attributed to healthcare.

These outcomes may include the following:

1. Changes in health status
2. Changes in knowledge acquired by patients and family members that may influence future care
3. Changes in the behavior of patients or family members that may influence future health needs
4. Satisfaction of patients and their family members with the care received and its outcomes (Donabedin, 1982, p. 82; 2003, p. 47).

Research Questions

The following research questions were developed to describe and understand CAUTI outcomes at a southeastern state's hospitals. The questions are framed using Donabedian's structure-process-outcome model (Donabedian, 2003, p. 46-47).

Structure

1. Were hospital structural factors (rural or urban location, profit or non-profit status, staffing ratio, and RN educational level) a predictor of CAUTI rates in 2009 and 2010?

Process

2. What processes to reduce CAUTIs have been implemented by hospitals in a southeastern state to address the evidence-based procedures recommended by CMS since 2009?

Outcomes

3. Is there a significant difference in southeastern hospitals' CAUTI rates from 2009 as compared to 2010?
4. Is there a significant difference between profit and non-profit hospital CAUTI rates from 2009 to 2010?
5. Is there a relationship between Registered Nurse staffing levels and CAUTI rates in southeastern hospitals from 2009 to 2010?
6. Is there a difference between the use of an established nurse-patient ratio and CAUTI rates in southeastern hospitals from 2009 to 2010?

Selection of Participants

The participant selection was purposive. The southeastern hospitals included in this study were identified by Southeastern Hospital Statistics (2010) which is a compilation of data on southeastern hospitals. The report provides data about the numbers, types, and locations of hospitals in the southeastern state as well as use of services, hospital finances, quality indicators, workforce data, and economic impact of southeastern hospitals as employers. The Infection Control Preventionist selected are located at acute care hospitals across a southeastern state. Exclusion criteria are: psychiatric, children's, rehabilitation, long-term acute, and veterans hospitals in the southeastern state.

The Infection Control Preventionist is the contact person asked to answer the survey. The Infection Control Preventionists' role and responsibilities are outlined by two main regulatory agencies, the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission

(TJC). All hospitals, according to The Social Security Act, mandate the establishment of minimum health and safety standards that must be met by providers and suppliers participating in the Medicare and Medicaid programs. These standards are found in the 42 Code of Federal Regulations. The Secretary of the Department of Health and Human Services has designated Centers for Medicare and Medicaid Services (CMS) to administer standards compliance aspects of these programs as outlined in the Conditions of Participation for Hospitals:

§482.42(a) Standard: Organization and Policies

A person or persons must be designated as infection control officer or officers to develop and implement policies governing control of infections and communicable diseases.

Infection control officers should maintain their qualifications through ongoing education and training, which can be demonstrated by participation in infection control courses, or in local and national meetings organized by recognized professional societies, such as the Association for Professionals in Infection Control and Epidemiology (APIC) and Society for Healthcare Epidemiology of America (SHEA) (CMS, 2012, p. 323).

The Joint Commission in their 2012 Comprehensive Accreditation Manual for Hospitals Infection Control Standard IC 01.01.01 states,

“The hospital leadership identifies the individual(s) responsible for the infection prevention and control program” (TJC, 2012, (b), p. 4).

In 2012 The Joint Commission approved one new National Patient Safety Goal (NPSG) for 2012 that focuses on CAUTIs for the hospital and critical access hospital accreditation programs.

NPSG.07.06.01 objective is to implement evidence-based practices to prevent indwelling

catheter-associated urinary tract infections (TJC, 2012, (a), p. 16).

Delimitations and Limitations

The foci of this study are CAUTIs in southeastern hospitals and the factors that influence the rates. The Infection Control Preventionists in acute-care hospitals are asked to complete and submit a survey. Participation in this study is strictly voluntary; if any participants feel uncomfortable answering the questions, they may withdraw from the study.

There are several limitations of this study: 1) Respondents may give answers they believe the researcher wants (because they know the researcher is a fellow ICP) rather than their true rates to avoid any embarrassment for their hospital. 2) The time frame that the survey was sent out was the same time as the national APIC Conference. 3) Due to the anonymity of the survey, it was not possible to go back and check to see if the hospitals had CAUTI scores reported on the Hospital Compare Website.

The advantage of this type of survey is that the answer to each research question is collected in a systematic and anonymous way.

Instrumentation

A survey exploring structure, process, and outcome variables related to CAUTI rates in a southeastern state was developed for this study by the researcher. This survey is divided into sections according to the Donabedian model: structure-process-outcome. The structure section contains questions relating to the characteristics of the hospital relating to location, size, ownership, staffing, demographics of the ICP, and equipment. The process section contains questions regarding the delivery of care practices and procedures as it relates to the prevention or

elimination of CAUTIs in each of the acute care southeastern state hospitals surveyed. The outcome section consists of questions relating to the CAUTI rates per 1000/catheter days for the years 2008, 2009, and 2010.

Rigor and validity are terms to used in the research process that are applied to the process itself as well as the instrument being used. Rigor, as defined in Burns and Grove (2009), is the striving for excellence in research through the use of discipline, scrupulous adherence to detail, and strict accuracy. This descriptive study requested, via an electronic survey, detailed factual and accurate information from Infection Control Preventionists that described existing phenomena of catheter associated urinary tract infections; and identified practices in southeastern hospitals as it relates to their current practices in prevention.

Validity is defined as the degree to which an instrument measures what it is intended to measure (Burns & Grove, 2009). The survey questions that were developed for this study strictly followed the framework of Donabedian's model: Structure, Process, Outcome definitions, (Burns & Grove, 2009; Donabedian, 2003).

The concepts of rigor and validity were tested using the survey questionnaire in a pilot study given to a group of Infection Control Preventionists. The ICPs in the pilot study were chosen from a group of regional ICPs who meet quarterly in their area for networking and education. The group received the survey. Each ICP was contacted and asked several questions regarding the survey questions. All were in agreement that it was pertinent, easy to follow, and user friendly. No recommendations for any changes were made by the group.

Protection of Human Subjects

Permission to conduct this descriptive research study was obtained from the Institutional Review Board (IRB) at the East Tennessee State University (ETSU). The research involves no more than minimal risk to the participants because an electronic survey was sent to their private workstation computer and the research involved no procedures from which written consent is normally required outside of the research context because the data requested to complete the survey have already been collected by the hospitals as part of their quality control processes.

An email was sent to each ICP private computer workstation practicing in a southeastern state acute care hospitals. It contained a letter of recruitment and all elements required for the consent process as required by the IRB at ETSU. Participation in the study was strictly voluntary and confidential.

Data Collection

The survey was administered to the Infection Control Preventionist (ICP) of acute care hospitals in the southeastern state via email link using the ETSU Quillen College of Medicine Survey System™. The questions were selected based on the Institute of Healthcare Improvement's recommendations for reducing and eliminating CAUTI (2011), and The Society for Healthcare Epidemiology of America and Infectious Diseases Society of America's (2008) Practice Recommendation: Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals. The ICPs' email addresses were obtained through the Association for Professionals in Infection Control and Epidemiology Chapter for a southeastern state. Permission to use the email addresses came via email from Candis Robinson, Manager,

Customer Service & Engagement of Association for Professionals in Infection Control and Epidemiology (personal communication, November 15, 2011) and is presented in Appendix A.

The use of an electronic survey was chosen as the method of data collection for this research project. Time constraints and distance were important factors for choosing this method. Studies have demonstrated that electronic surveys' greatest benefit is the decreased cost and time for the researcher; electronic surveys do not require photocopying, folding, envelopes, or postage. Participants (ICPs) receive electronic surveys much faster than mailed surveys. The ICPs received the surveys instantly at their email addresses and completed them privately at a convenient time. Once the survey was completed and submitted, the researcher has immediate access to the results for review and analysis.

The need to reach ICPs across the southeastern state was another consideration that made electronic surveys the most logical choice. The capabilities to reach the ICPs across the southeastern state in a short amount of time, despite being separated by great geographic distances was determined to be the most efficient use of research time (Amar, 2008; Andrews, Nonnecke, & Preece, 2003; Bachmann & Elfrink, 1996; Garton, Haythornthwaite, & Wellman, 1997; Hutchinson, Fleishman, & Johnson, 1998; Llieva, Baron, & Healey, 2002; Taylor, 2000; Yun & Trumbo, 2000).

An email was sent to each addressee that contained a request to participate in the research study; the request included all the elements for consent as required by East Tennessee State University Institutional Review Board. The participants had a link provided on the email that stated that clicking on the *next* button, their consent was implied, and they could then complete

and submit the actual survey. The timeline for completion of the survey was outlined in the initial email. According to the Instructional Assessment Research guide the acceptable response rate for emailed surveys is 30%-60% return (IAR, 2011). Due to the challenges of getting high response rates when conducting online surveys it was recommended that a reminder email be sent within 1 week, between the hours of 7:30-8:30am and 3:30-4:30pm. This timetable has shown to be more effective in increasing the response rate in online surveys (Ritter & Sue, 2007). The survey was sent on May 30, 2012, at 8:15 am to the ICPs, a reminder email was sent to each ICP on June 8, 2012, at 7:30 am.

The survey data were automatically uploaded to a data base from which statistical analyses could proceed.

Data Analysis

The data collected from the surveys were summarized, organized, and analyzed. Because of the low number of CAUTI rates actually given, it was not possible to do independent *t* tests, and logistic regression via IBM SPSS version 20. Instead the descriptive data were reported in groups according to the category of each question, whether it is Structure, Process, or Outcome related as follows:

Structure

Research Question 1. Were hospital structural factors (rural or urban location, profit or non-profit status, staffing ratio and RN educational level) a predictor of CAUTI rates in 2009 and 2010?

Descriptive data were organized into tables and reported, summarizing the various structural factors indicated in the research question.

Process

Research Question 2. What processes to reduce CAUTIs have been implemented by hospitals in a southeastern state to address the evidence-based procedures recommended by CMS since 2009?

Descriptive data were organized into tables and reported, summarizing the various processes that have been recommended for use to prevent CAUTIs.

Outcomes

Research Question 3. Is there a significant difference in southeastern hospitals' CAUTI rates from 2009 as compared to 2010?

Research Question 4. Is there a significant difference between profit and non-profit hospital rates from 2009 to 2010?

Research Question 5. Is there a significant difference between Registered Nurse staffing ratios and CAUTI rates in southeastern hospitals from 2009 to 2010?

Research Question 6. Is there a difference between the use of an established nurse-patient ratio and CAUTI rates in southeastern hospitals from 2009 to 2010?

Descriptive data were organized into tables and reported, summarizing the outcomes reported by respondents.

Quality and Integrity

The quality and integrity of the data were ensured by protecting the privacy and confidentiality of all participants who are included in survey. The surveys were anonymous and were uploaded to a secure data bank. The data were reviewed for completeness of the surveys.

Although surveys were missing data, such as not giving CAUTI scores, no surveys were eliminated from the study. The results were described truthfully and accurately recorded.

All written materials generated from the study have been stored in a locked cabinet at the researcher's office located at 214 Happy Trails, Staffordsville, KY for the required 5 years.

Chapter 4 discusses the data analysis.

CHAPTER 4

DATA ANALYSIS

This descriptive research study was conducted by sending an electronic survey to Infection Control Preventionists (ICP) in acute care hospitals in a southeastern state using ETSU Quillen College of Medicine “Checkbox”™ survey system. Respondents were completely anonymous. Surveys were sent directly into ICPs email. Seventy-six surveys were sent out with 38 returned, a 52% response rate.

The data collected were placed in IBM Statistical Package for the Social Sciences Version 20 (IBM SPSS) spreadsheet. The data were cleaned and verified. Several system flaws were discovered in exporting of the data to SPSS. CAUTI rates were missing in some of the responses because they were given in the x/1000 form or CAUTI rates/per 1000 catheter days rather than a single number (i.e. 1.23). Upon further review, the survey questions that offered the option of answering “other” with a blank for filling in, did not always export correctly. The data were manually entered into SPSS when respondents chose the option of specifying what “other” was for their hospitals.

Demographics

Table 1 depicts the characteristics of the participating hospitals.

Table 1

Participating Hospital Demographics by Reported Frequencies

(N=38)	<u>Number</u>	<u>Percent of Total</u>
<100 Beds	18	47%
> 100 Beds	20	53%
Rural Location	26	68%
Urban Location	12	32%
For-Profit Status	12	32%
Nonprofit Status	26	68%
Had An Established Nurse Patient Ratio	15	39%
Did Not Have An Established Nurse Patient Ratio	7	19%
Nurse Patient Ratio Left Blank in Survey	16	42%
Reported Staff Educational Level	9	24%
Did Not Report Staff Educational Level	29	76%

Overall, 18 of the 38 respondents (47%) worked in hospitals with fewer than 100 beds; 20 worked in hospitals with more than 100 beds.

Twenty-six (68%) were from rural hospitals. All 18 hospitals with fewer than 100 beds

were rural. Of this group, only 56% were nonprofit while the rest of the rural hospitals with fewer than 100 beds were for-profit hospitals (44%).

Overall 26 of the 38 respondents (68%) worked in nonprofit hospitals; of this group, 38% (10) were rural nonprofit hospitals. Twelve (32%) were in for-profit organizations. Almost 60% (7) of the 12 for-profit hospitals were rural. The only urban hospitals to respond to the survey were greater than 100 beds and nonprofit; however, there were five urban for-profit hospitals with greater than 100 beds that received the surveys.

Only 15 (39%) of the total group reported having an established nurse patient ratio. Seven said they did not have an established nurse patient ratio, and 16 left this question blank.

The participating ICPs demographics are displayed in Table 2.

Table 2

Participating ICP Demographics by Reported Frequencies

	<u>Number</u>	<u>Percent</u>
(N=38)		
Age <40	5	13%
Age >41	11	29%
Age Not Reported	22	58%
Female	18	47%
Male	0	0%
Gender Not Reported	20	53%
Years as ICP <5	10	26%
Years as ICP 6-10	4	11%
Years as ICP > 11	4	11%

Table 2 (continued)

Years as ICP Not Reported	20	53%
Years as RN <5	2	1%
Years as RN 6-10	0	0%
Years as RN >11	16	42%
Years Not Reported	22	58%
Educational Level of ICP-ADN	6	16%
Educational Level of the ICP-BSN	7	18%
Educational Level of the ICP-MSN	0	0%
Educational Level of the ICP Not Reported	24	63%

Examining the demographics of the ICPs, many (22) did not give their age. Of the 16 who provided their age, 69% (11) were over 41 years of age while 31% (5) were 40 or under. In fact, seven respondents were in their 50s, and two in their 60s. Only 18 respondents gave their gender, all were female.

Overall 53% of the ICPs did not report their years in the ICP role. Only 47% (18) respondents reported their years of ICP experience. Of these half had fewer than 5 years ICP experience, while four had 6-10 years ICP experience, and four had over 11 years ICP experience.

Most (58%) ICP respondents did not report their years of experience as an RN. Generally ICPs have been in the RN role for several years before becoming an ICP. In fact, of those who reported, 42% had over 11 years RN experience with only two respondents reporting fewer than 2 years experience.

Educationally, 63% (24) did not report their educational level. Six reported being ADN's while seven had BSN's. No one reported having an MSN or a higher degree.

The findings in Tables 3 through 27 are reported from the perspective of the Donabedian Model for quality assurance under the headers, Structures, Process, and Outcome.

Structure

Research Question 1. Were hospital structural factors (rural or urban location, profit or nonprofit status, staffing ratio, and RN educational level) a predictor of CAUTI rates in 2009 and 2010?

Research Question 1 was answered with descriptive statistics. Only seven respondents reported their CAUTI rates in 2009 and 2010 so the number of respondents was too low to run a logistic regression as planned. The variables for staffing ratio and RN educational level had very few responses as well. Thus there was insufficient data for inferential statistical analysis.

Data presented in Table 3 depicts the seven respondents who reported CAUTI rates. This is followed by Table 4, hospitals that did not report CAUTI rates. Table 4 is presented because respondents indicated they took additional measures even though they did not report actual CAUTI rates.

Table 3

Structure--For Hospitals That Reported CAUTI Rates by Reported Frequencies

(N=7)	<u>Number</u>	<u>Percent of Total</u>
<100 Beds	3	43%
> 100 Beds	4	57%
Rural Location	5	71%

Table 3 (continued)

	<u>Number</u>	<u>Percent of Total</u>
Urban Location	2	29%
For-Profit Status	2	29%
Nonprofit Status	5	71%
Staffing Ratio	4	57%
Staffing Ratio Left Blank in Survey	3	43%
Reported Number of Licensed Practical Nurses	4	57%
Reported Number of Diploma Nurses	0	0
Reported Number of Associate Degree Nurses	4	57%
Reported Number of Baccalaureate Nurses	4	57%
Reported Number of Master Nurses	4	57%
Reported Number of Doctorate Nurses	3	43%
Reported Number of Non-Nursing Doctorate	1	1%
Reported Number of Nursing Doctorate	3	43%
Number of Nurses Left Blank in Survey	3	43%

Those That Reported CAUTI Rates

Hospital structural factors. Of the seven that reported CAUTI rates, five hospitals were nonprofit while two were for-profits. Five hospitals were rural while two were urban. Four hospitals were over 100 beds, while 3 were fewer than 100 beds. However, the combinations of hospitals designations varied. For example, two nonprofit rural hospitals were fewer than 100 beds while two nonprofit urban hospitals were over 100 beds. The remainder was: One rural nonprofit hospital over 100 beds; one rural for-profit over 100 beds; and one rural for-profit

hospital with fewer than 100 beds.

Staffing ratios. Four of the seven hospitals reporting CAUTI rates reported having actual staffing ratios. Of these, one rural for-profit hospital with more than 100 beds reported that its staffing was dependent upon the specific units. i.e., “ranges 1:1 to 5:1 depending on intensity of care (ICU)”;

“varies according to unit. For ICU it is 2-3:1; TCU 3-4:1; Med-Surg generally 6:1”.

Three of the four hospitals (two rural, nonprofit with fewer than 100 beds and one urban for-profit with more than 100 beds) gave actual ratios. These three hospitals were consistent in their ratios: Medical/Surgical 1:8; ICU 1:2 and 1:3; PCU was 1:7. Two hospitals have a split shift in the ER with a nurse coming in at 12 noon.

Educational levels of nursing staff. Three of the seven hospitals did not give the educational level of their nursing staff. Four respondents did answer the nursing staff education question.

One of the four respondents (rural, for-profit, with fewer than 100 beds) reported it had 10 LPNs, 42 ADNs, 6 BSNs. So they predominately had ADNs.

Another group had predominately BSNs. One respondent (one urban, nonprofit, more than 100 beds) reported the educational level for their staff as: LPNs 100; Diploma 325; ADNs 1,110; BSNs 3,025; Master’s 14; and Doctorate 4.

The last respondent had predominately LPNs. One of the four respondents (rural, nonprofit, with fewer than 100 beds) reported staff education as: 84 LPNs, 2 Diploma, 7 ADNs, 15 BSNs, 8 Masters, and 21 patient care techs.

The answers about nurse education level were very sparse and some were unreliable for

this group. For example, one urban nonprofit hospital with more than 100 beds reported it had six BSN nurses, one nonnursing doctorate, and six doctorate nurses on staff. Another example was a rural, nonprofit hospital with fewer than 100 beds who reported as having on its Med-Surg unit, “1-8” for the category under doctorate nurses, and “21 patient care tech” under the number of nurses with doctorates in nursing.

Those That Did Not Report CAUTI Rates

Table 4

Structure--For Hospitals That Did Not Report CAUTI Rates by Reported Frequencies

	<u>Number</u>	<u>Percent of Total</u>
(N=31)		
<100 Beds	16	52%
> 100 Beds	15	48%
Rural Location	21	55%
Urban Location	10	32%
For-Profit Status	9	29%
Nonprofit Status	22	71%
Staffing Ratio	18	58%
Did Not Have A Staffing Ratio	7	23%
Staffing Ratio Left Blank in Survey	13	42%
Reported Number of Licensed Practical Nurses	5	16%
Reported Number of Diploma Nurses	2	6%
Reported Number of Associate Degree Nurses	3	10%
Reported Number of Baccalaureate Nurses	3	10%
Reported Number of Master Nurses	3	10%
Reported Number of Doctorate Nurses	3	10%
Reported Number of Non-Nursing Doctorate	1	3%
Reported Number of Nursing Doctorate	2	6%

Table 4 (continued)

	<u>Number</u>	<u>Percent of Total</u>
Number of Nurses Left Blank in Survey	25	81%

Hospital structural factors. Of the 31 respondents that did not report CAUTI rates, 16 hospitals (52%) were rural with fewer than 100 beds--nine being nonprofit and seven for-profit. The 15 remaining hospitals reported their size as more than 100 beds. Seven of the 15 hospitals were urban nonprofit, while eight hospitals were rural--three being nonprofit and five for-profit.

Examination of the rural-urban designation for the 31 hospitals revealed that 21 of the 31 hospitals were located in rural areas--12 were nonprofit while nine were for-profit. The 10 hospitals in an urban setting were all nonprofit with more than 100 beds.

Hospital ownership from those that did not report CAUTI rates, were 22 nonprofit with 14 having more than 100 beds, while nine were for-profit. Of the nine for-profits, three had more than 100 beds.

Staffing ratios. Only five respondents that did not report CAUTI rates actually gave a staffing ratio. Four were from rural hospitals with fewer than 100 beds (three nonprofit and one for-profit).

Examining staffing ratios, three respondents (rural, nonprofit with fewer than 100 beds) reported Medical/ Surgical as 1:6, 1:8, and ICU 1:2-3. One respondent (in an urban, nonprofit hospital with fewer than 100 beds) gave an actual staffing ratio for their ICU as 1:2 or 1:5 depending on intensity of care--with no other ratio provided. The last respondent (rural, nonprofit, with fewer than 100 beds) reported its staffing ratio as 1:5 (it did not identify the type

of unit).

Educational levels of nursing staff. Of the 31 respondents, four rural hospitals with fewer than 100 beds answered the staff education question. For two hospitals, the staff education level was very sparse and not very reliable. For example, a rural nonprofit hospital with fewer than 100 beds reported having six BSNs and one MSN on staff. Another example of the unreliability in one of the two hospitals was a rural for-profit hospital with fewer than 100 beds that reported six LPNs on staff. These two respondent responses were not used.

Three hospitals reported staffing ratios as: one (rural, for-profit hospital with more than 100 beds) reported: 10 LPNs, 1 Diploma, 1 ADN; and 6 BSNs. The second (rural, nonprofit, with fewer than 100 beds) had 10 LPNs, 50 ADNs, 5 BSNs, and 1 MSN. The third (rural, nonprofit with fewer than 100 beds) reported 460 LPNs, 10 ADNs, and 1-6 doctorate prepared nurses.

Process

Research Question 2. What processes to reduce CAUTIs have been implemented by hospitals in a southeastern state to address the evidence-based procedures recommended by CMS since 2009?

It was not possible to do the planned statistical tests because only seven respondents reported CAUTI rates. Instead descriptive data are provided for the seven respondents that gave CAUTI rates and the 31 that did not give CAUTI rates. Because the group that did not report CAUTI rates implemented processes that would improve CAUTI rates, they will also be reported.

The process section of the Donabedian Model deals with the activities that constitute healthcare that may include technical process, prevention, and education--carried out by healthcare personnel. The research question developed for the process section of this survey examines the processes used by southeastern hospitals to reduce or eliminate CAUTIs. The three process areas examined were: 1) technical processes, 2) prevention processes, and 3) education processes.

In the following sections Table 5 presents the data from the total group, followed by Table 6 breaking out data from the group giving CAUTI rates, and Table 7 presenting data from those that did not report CAUTI rates.

Technical Processes

The hospitals were queried on the areas of their technical processes regarding catheters and equipment. The respondents were asked to identify types of catheters used in their hospitals 1) rubber, 2) silicone, 3) Texas catheters, or 4) other; and were asked if they purchased equipment such as bladder scans or silver-coated catheters.

Types of catheters used and equipment purchased by frequency reported for the total group is displayed in Table 5.

Total group responses--Types of catheters used and equipment purchased by reported frequencies.

Table 5

Overall Responses--Types of Catheters Used and Equipment Purchased by Reported Frequencies

(N=38)

Silicone	Rubber	Texas	Silver-coated	Other--Latex	Did Not Report	Bladder Scans Purchased
14 (37%)	7 (18%)	10 (26%)	3 (8%)	1 (3%)	18 (47%)	11 (29%)

Thirty-eight hospitals responded to the technical process questions. Overall, half of the respondents answered the questions regarding what type of catheters they used at their facilities. Silicone catheters were used most frequently (37%) in the hospitals. Of the 19 respondents 11 (29%) hospitals purchased bladder scans as a means of reducing unnecessary catheter insertions.

Eighteen of the 38 respondents did not report what they used.

The types of catheters used and equipment purchased by reported frequencies for overall responses by hospital types are displayed in Table 6.

Table 6

Overall Responses by Hospital Type--Types of Catheters Used and Equipment Purchased by Reported Frequencies

(N=38) Entire Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
	Number (Percent)				
Silicone Catheters	7 (18%)	1 (3%)	1 (3%)	2 (5%)	3 (8%)
Texas Catheters	5 (13%)	0	1 (3%)	1 (3%)	3 (8%)
Rubber Catheters	3 (8%)	0	3 (8%)	1 (3%)	3 (8%)
Bladder Scans	3 (8%)	1(3%)	2 (6%)	2 (6%)	3 (8%)
Silver-coated	1 (3%)	0	0	0	1 (3%)
Other-Latex	0	0	0	0	1 (3%)
Other- Silver	1 (3%)	0	0	0	0
None of catheter choices offered in this survey used	3 (8%)	3 (8%)	6 (16%)	1 (3%)	5(16%)

Here the answers on ‘types of catheters used in each facility’ are further broken out by hospital type. One urban nonprofit hospital, with more than 100 beds reported not using any of the three catheters offered in the survey, but answered “other” and listed rubber (latex) as their choice.

Three hospitals with fewer than 100 beds used only rubber catheters--two were rural, for-profit, hospitals, while one was rural, nonprofit. One rural, nonprofit hospital with fewer than 100 beds used rubber and silicone catheters.

Two urban, nonprofit hospitals with more than 100 beds used rubber and Texas catheters.

Four hospitals reported solely using silicone catheters--all had more than 100 beds. Two were rural--one nonprofit and one for-profit, and, two were urban, nonprofit. One urban, for-profit hospital, with more than 100 beds used silicone and silver-coated catheters. Seven hospitals used silicone and Texas catheters--five rural nonprofit with fewer than 100 beds while two were more than 100 beds--one being urban nonprofit and one being rural for-profit.

One rural, nonprofit hospital, with fewer than 100 beds used rubber, silicone, Texas, and “other” catheter types--“other” was reported as silver-coated. One rural, for-profit hospital with fewer than 100 beds hospital used all three types, and reported purchasing silver-coated catheters as well.

Types of catheters and equipment purchased by reported frequencies for those hospitals that reported CAUTI rates are displayed in Table 7.

Those that reported CAUTI rates--Types of catheters and equipment purchased.

Table 7

Those That Reported CAUTI Rates by Hospital Type--Types of Catheters Used and Equipment Purchased by Reported Frequencies

(N=7) Those Who Reported CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
	Number (Percent)				
Silicone Catheters	2 (29%)	1(14%)	1(14%)	1(14%)	2(29%)
Texas Catheters	1 (14%)	0	1(14%)	1(14%)	1(14%)
Rubber Catheters	0	0	1(14%)	0	0
Bladder Scans	0	1(14%)	0	1(14%)	1(14%)
Silver-coated	0	0	1(14%)	0	1(14%)
Other-Latex	0	0	0	0	0
None of catheter choices offered in this survey used	0	0	0	0	0

Of the seven respondents who gave their CAUTI rates, 100% of the hospitals used silicone catheters. Texas catheters were used in conjunction with the silicone catheters in 72% of the

respondent's hospitals. Rubber catheters were used in only one rural, for-profit hospital that had fewer than 100 beds. Two respondents purchased silver-coated catheters: one was a rural, for-profit hospital with fewer than 100 beds, and one was an urban nonprofit hospital with more than 100 beds.

Bladder scans were purchased in three of the seven hospitals. All three hospitals had more than 100 beds, with two being rural nonprofit hospitals.

Types of catheters used and equipment purchased by reported frequencies for those hospitals that did not report CAUTI rates are displayed in Table 8.

Those that did not report CAUTI rates--Types of catheters and equipment purchased.

Table 8

Those That Did Not Report CAUTI Rates by Hospital Type--Types of Catheters Used and Equipment Purchased by Reported Frequencies

(N=31) Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
	Number (Percent)				
Silicone Catheters	5 (16%)	0	0	1 (3%)	1 (3%)
Texas Catheters	4 (13%)	0	0	0	2 (7%)
Rubber Catheters	3 (10%)	0	2 (7%)	0	2 (7%)
Bladder Scans	3 (10%)	0	2 (7%)	1 (3%)	2 (7%)

Table 8 (continued)

Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
	Number (Percent)				
Silver-coated	1 (3%)	0	0	0	0
Other-Latex(rubber)	0	0	0	0	1(3%)
None of catheter choices offered in this survey used	2(7%)	3(10%)	6(19%)	1(3%)	6(19%)

Respondents that did not report CAUTI rates had a 100% response rate to the survey questions regarding the types of catheters used in their hospitals. Eighteen of the 31 respondents answered they did not use rubber, Texas, or silicone catheters in their hospitals and did not elaborate what they did use.

Three hospitals reported using only rubber catheters--all were rural with fewer than 100 beds-- two were nonprofit with one being for-profit. Two hospitals solely used silicone catheters; both had more than 100 beds--one was rural for-profit and one was urban nonprofit. None of the respondents used silver- coated catheters.

Bladder scans were purchased in eight hospitals. Three of the eight were rural for-profit hospitals and two of the three had fewer than 100 beds.

Five of the eight hospitals were nonprofit with two classified as urban. Of these two had fewer than 100 beds and one had more than 100 beds.

Prevention Process

The second segment of data to be analyzed is the prevention process. Respondents were asked whether additional measures, IHI recommendations, and additional procedures were taken to reduce or eliminate CAUTIs in their hospitals. Did they send the implementation measures through hospital committees, and what was the implementation date for the CAUTI initiative processes?

Table 9 through Table 17 the total group response data are presented for: additional measures taken, and adoption of the IHI recommendations for the reduction or elimination of CAUTIs. This is followed by a narrative for Tables 9 through 17. Next, a brief explanation for additional procedures, implementation dates, and if the CAUTI prevention processes were sent through hospital committees for review.

Total group responses for the use of checklists, policies, and time outs by reported frequencies are displayed in Table 9.

Total Group Responses

Additional measures.

Table 9

Additional measures-- Checklists, Policies and Time Outs by Reported Frequencies

(N=38)	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
Entire Group					
Additional Measures	Number (Percent)				
Checklists	4 (11%)	0	2 (6%)	1 (3%)	3 (8%)
Policies	7 (18%)	1 (3%)	1 (3%)	1 (3%)	3 (8%)
Timeouts	0	0	1 (3%)	0	0
Other: Chart Stickers	1 (3%)	0	0	0	0
Other: Daily Review	1 (3%)	0	0	0	0

Fourteen of the 38 hospitals (approximately 40%) instituted all four measures: check lists, policies, time outs and “other” to reduce and eliminate CAUTIs. Of the 14 respondents, nine hospitals were rural. Eight of the nine hospitals had fewer than 100 beds (6 nonprofit and 2 for-profit). One of the nine hospitals was for-profit (with more than 100 beds). Five of the 14 hospitals were urban nonprofit (with more than 100 beds). Twenty-four hospitals did not report anything.

One of the 14 hospitals (rural, for-profit hospital with fewer than 100 beds) used three of the measures: check lists, policies, and time outs as additional measures to reduce or eliminate CAUTIs.

Ten of the 14 hospitals used two of the measures. Eight hospitals used check lists and policies to reduce or eliminate CAUTIs. Four of the eight were rural--two nonprofit, with fewer than 100 beds and two were for-profit (one with more than 100 beds and one with fewer than 100 beds). Four of the eight hospitals were urban, nonprofit, with more than 100 beds. The ninth hospital adopted policy change and a daily review (rural, nonprofit, hospital with fewer than 100 beds.) The tenth hospital (rural nonprofit with fewer than 100 beds) used policy and “other”, identified as chart stickers, as their additional measure to reduce or eliminate CAUTIs.

Three hospitals implemented one measure. Two of the hospitals--one rural, nonprofit, with less than 100 beds; and one urban, nonprofit, with more than 100 beds--developed policies to reduce or eliminate CAUTIs. The third hospital (rural, for-profit, hospital with fewer than 100 beds) identified check lists as the one measure they would implement to reduce or eliminate CAUTIs.

IHI recommendations by reported frequencies for the total group are displayed in Table 10.

IHI recommendations.

Table 10

Total Group-- IHI Recommendations by Reported Frequencies

(N=38) Entire Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
IHI Recommendations					
	Number (Percent)				
Avoid Unnecessary Catheterizations Insert Using Sterile Technique Maintain According to Guidelines	7 (18%)	1 (3%)	1 (3%)	1 (3%)	3 (8%)
Daily Review Did Not Adopt IHI Recommendations	7 (18%)	1 (3%)	1 (3%)	1 (3%)	4(11%)
	4 (11%)	3 (8%)	7(18%)	2 (5%)	7 (18%)

Thirteen of 38 (1/3) respondents adopted all four IHI recommendations--avoiding the use of unnecessary catheters, inserting urinary catheters using sterile technique, maintaining urinary catheters based on recommended guidelines, and reviewing urinary catheter necessity daily against criteria. Nine of the 13 hospitals were rural--seven being nonprofit, with five of the seven having fewer than 100 beds, while two of seven hospitals were for-profit--one with fewer than

100 beds and one had more than 100 beds. Four of the 14 were urban nonprofit, hospitals with more than 100 beds.

Four urban, nonprofit hospitals with more than 100 beds adopted all four of the IHI recommendations.

One urban, nonprofit hospital with more than 100 beds implemented two of the four IHI recommendations--inserting catheters using sterile technique and doing a daily review of catheter necessity.

Total group that implemented additional measures to reduce or eliminate CAUTIs are displayed in Table 11.

Additional procedures.

Table 11

Total Group-- Additional Procedures

(N=38) 14 Respondents answered

Entire Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
<u>Additional Procedures</u>	Number (Percent)				
Foley Catheter Bags Off the Floor Foley Tubing Secured to Patient Leg	7(18%)	1(3%)	1(3%)	1(3%)	4(11%)
	7(18%)	1(3%)	1(3%)	1(3%)	4(11%)

Table 11 (continued)

Foley Tubing Not Kinked	7(18%)	1(3%)	1(3%)	1(3%)	4(11%)
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Fourteen of the 38 hospitals (40%) used the three additional procedures to reduce or eliminate CAUTIs: keeping foley catheter bags off the floor, keeping foley catheter tubing secured to the patient’s leg, and keeping the foley catheter tubing free of kinks. Nine of the 14 hospitals were rural--nonprofit, with fewer than 100 beds. Two of the nine hospitals were rural, for-profit--one hospital with more than 100 beds, while one for-profit hospital had fewer than 100 beds. Five of the 14 respondents were urban, nonprofit hospitals with more than 100 beds

Implementation processes: Sent through committees. Nine ICPs responded to the question that they affirmed using committees. Overall, as part of the implementation process, eight sent this to the Infection Control Committee, seven sent this to the Performance Improvement Committee, two sent this to the Medical Staff Committee, and one to the Board of Trustees.

For example, four of the nine hospitals affirmed sending the implementation processes to the Infection Control Committee, Performance Improvement Committee, and Medical Staff. Of these four, all were rural--two were nonprofit with fewer than 100 beds, while two were for-profit--one with fewer than 100 beds, one with more than 100 beds.

Two urban, nonprofit hospitals with more than 100 beds sent implementation processes to the Infection Control Committee and Performance Improvement Committee.

One of the nine hospitals--an urban, nonprofit hospital with more than 100 beds--sent the implementation processes to the Infection Control Committee and the Medical Staff.

One of the nine hospitals--urban, nonprofit, with more than 100 beds--reported sending the implementation processes to the Performance Improvement Committee.

One of the nine hospitals--rural, nonprofit, with fewer than 100 beds--sent the implementation processes to the Infection Control Committee, Performance Improvement Committee, Medical Staff, and the Board of Trustees.

Implementation dates. Nine of 38 hospitals (25%) reported implementation dates for their process to reduce or eliminate CAUTIs: two of these in 2010, four in 2011, and three in 2012.

Tables 12 through 17 display the data for additional measures taken and adoption of the IHI recommendations by the two hospital groups: those that reported CAUTI rates and those that did not. Then a narrative follows explaining the table data, along with a discussion on additional procedures, implementation dates, and whether the CAUTI prevention processes were sent through hospital committees for review.

Additional measures: checklists, policies, and timeouts for the hospitals that reported CAUTI rates are displayed in Table 12.

Those that reported CAUTI rates.

Additional measures: Checklists, policies and time outs.

Table 12

Additional Measures-- Checklists, Policies and Time Outs by Reported Frequencies.

(N=7) Reported CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
Additional Measures	Number (Percent)				
Checklists	2 (29%)	0	1 (14%)	1 (14%)	1 (14%)
Policies	2 (29%)	1 (14%)	1 (14%)	1 (14%)	1 (14%)
Timeouts	0	0	1 (14%)	0	0
Other: Chart Stickers	0	0	0	0	0
Other: Daily Review	0	0	0	0	0
Did Not Adopt Additional Measures	0	0	0	0	1(14%)

Six of the seven hospitals reporting CAUTI rates used additional measures to reduce or eliminate CAUTIs (four used checklists and policies, one used checklists, policies and time outs, and one used only policies). One urban, nonprofit hospital with more than 100 beds did not use any additional measures for the CAUTI prevention.

The hospitals that did report CAUTI rates that adopted IHI recommendations as reported by frequencies are displayed in Table 13.

IHI recommendations.

Table 13

Those That Reported CAUTI Rates--IHI Recommendations by Reported Frequencies

(N=7)

Those That Did Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
IHI Recommendations	Number (Percent)				
Avoid Unnecessary Catherizations	2 (29%)	1 (14%)	1 (14%)	1(14%)	2(29%)
Insert Using Sterile Technique	2 (29%)	1 (14%)	1 (14%)	1(14%)	2(29%)
Maintain According to Guidelines	2 (29%)	1 (14%)	1 (14%)	1 (14%)	2(29%)
Daily Review	2(29%)	1 (14%)	1 (14%)	1 (14%)	2 29%)
Did Not Adopt IHI's Rec.	0	0	0	0	0

All seven that reported CAUTI rates adopted the IHI's four recommendations--avoiding the use of unnecessary catheters, inserting urinary catheters using sterile technique, maintaining urinary catheters based on recommended guidelines, and reviewing urinary catheter necessity

daily against criteria.

Additional procedures adopted by the group that reported CAUTI rates are displayed in Table 14.

Additional Procedures.

Table 14

Additional Procedures--Those That Reported CAUTI Rates

(N=7)

Those That Reported CAUTI Rates Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
<u>Additional Procedures</u>	Number (Percent)				
Foley Catheter Bags Off the Floor	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)
Foley Tubing Secured to Patient Leg	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)
Foley Tubing Not Kinked	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)

All seven who reported CAUTI rates confirmed that foley catheter bags were kept off the floor; foley catheter tubing was not kinked and was secured to the patient’s leg.

Of the seven hospitals five were nonprofit--three were rural (two hospitals had fewer than 100 beds and one had more than 100 beds). Two of the five nonprofit hospitals were urban, with

more than 100 beds.

Two of the remaining seven hospitals that used additional procedures were rural, for-profit (one with fewer than 100 beds and one hospital with more than 100 beds).

Implementation processes: Sent through committees. All seven respondents sent their implementation processes through the Infection Control Committee, the Performance Improvement Committee, and the Medical Staff Committee, although none of the seven hospitals sent implementation processes to the Board of Trustees.

Implementation dates. Implementation dates for CAUTI processes in the seven hospitals reporting CAUTI rates, were given in five of the seven responses. In 2010 two hospitals implemented CAUTI processes--one urban, nonprofit with more than 100 beds and one rural for-profit hospital with fewer than 100 beds. Two rural hospitals implemented CAUTI processes in 2011--nonprofit hospital with fewer than 100 beds and one for-profit hospital with more than 100 beds. One rural, nonprofit hospital with fewer than 100 beds reported implementing CAUTI processes in 2012.

The group that did not report CAUTI rates that adopted additional measures such as: Checklists, policies and timeouts as reported by frequencies are displayed in Table 15.

Those That Did Not Report CAUTI Rates

Additional measure--Checklists, policies, and time outs.

Table 15

Additional Measures-- Checklists, Policies, and Time Outs by Reported Frequencies

(N=31) Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
<u>Additional Measures</u>	Number (Percent)				
Checklists	2 (7%)	0	1 (3%)	0	2 (7%)
Policies	5 (16%)	0	0	0	2 (7%)
Timeouts	0	0	0	0	0
Other: Chart Stickers	1 (3%)	0	0	0	0
Other: Daily Review	1 (3%)	0	0	0	0
Did Not Adopt Additional Measures	4 (13%)	3 (10%)	5 (16%)	2 (7%)	8 (26%)

Eight of the 31 respondents adopted additional measures aimed at reducing or eliminating CAUTIs. Of the eight respondents, four hospitals reported using check lists and polices in an effort to reduce or eliminate CAUTIs. Of the four hospitals--three were rural with fewer than 100

beds--two nonprofit, while one was for-profit; one was an urban, nonprofit, hospital with more than 100 beds.

IHI recommendations adopted by the group that did not report CAUTI rates are displayed in Table 16.

IHI Recommendations.

Table 16

CAUTI Rates Not Reported--IHI Recommendations by Reported Frequencies

(N=31) 7 of the 31 Responded using part of the IHI recommendations

Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
<u>IHI Recommendations</u>	Number (Percent)				
Avoid Unnecessary Catherizations	5 (16%)	0	0	0	1 (3%)
Insert Using Sterile Technique	5 (16%)	0	0	0	2 (7%)
Maintain According to Guidelines	5 (16%)	0	0	0	1 (3%)
Daily Review	5 (16%)	0	0	0	2 (7%)
Did Not Adopt IHI's Rec.	4 (13%)	3 (10%)	2 (7%)	7 (23%)	7 (23%)

Seven of the 31 hospitals reported adopting the IHI recommendations. Six of the seven hospitals adopted all four of the recommendations. All six of the hospitals were nonprofit--three were rural with fewer than 100 beds while two had more than 100 beds and one was an urban hospital with more than 100 beds. One of the seven hospitals (urban, nonprofit with more than

100 beds) adopted only two of the four IHI recommendations (inserting catheters using sterile technique and performing a daily review for catheter necessity).

Additional procedures for the group that did not report CAUTI rates are displayed in Table 17.

Additional procedures.

Table 17

Additional Procedures--Those That Did Not Report CAUTI Rates

(N=31) 7 of the 31 Responded

Those That Did Not Report CAUTI Rates Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
<u>Additional Procedures</u>	Number (Percent)				
Foley Catheter Bags Off the Floor	5(16%)	0	0	0	2(7%)
Foley Tubing Secured to Patient Leg	5(16%)	0	0	0	2(7%)
Foley Tubing Not Kinked	5(16%)	0	0	0	2(7%)

Seven of the 31 respondents reported using additional procedures--keeping foley bags off the floor, making sure that catheter tubing was secure to the patient's leg, and ensuring catheter

tubing is not kinked. The seven hospitals were all nonprofit. Five of the seven hospitals were rural, fewer than 100 beds; two were urban, with more than 100 beds.

Implementation processes: Sent through committees. Eight of the 31 respondents sent their implementation process through hospital committees. Two rural hospitals with fewer than 100 beds (one nonprofit and one for-profit) sent implementation processes to the Infection Committee only. Two nonprofit hospitals (one rural with fewer than 100 beds and one urban with more than 100 beds) had implementation processes sent through the Infection Control Committee, the Performance Improvement Committee, and the Medical Staff Committee. Two rural, nonprofit hospitals with fewer than 100 beds used the Infection Control Committee, the Performance Improvement Committee, the Medical Staff, and the Board of Trustees for review and approval of implementation processes.

One urban nonprofit hospital with more than 100 beds sent implementation processes to the Infection Control Committee and the Performance Improvement Committee. One rural nonprofit hospital with fewer than 100 beds used the Infection Control Committee and the Medical Staff for the review of the implementation process.

Implementation dates. Implementation dates were reported by 4 of the 31 respondents, yet they did not report CAUTI rates. Two of the four hospitals instituted the prevention processes in 2010--both were rural, nonprofit, fewer than 100 beds. In 2011, the remaining two hospitals--rural, nonprofit, with fewer than 100 beds implemented prevention processes.

Education Process

Education is the key to implementing the prevention processes. The respondents were asked how this was accomplished, i.e., did they do education on CAUTI prevention, was the implementation date for the educational program reported, how was the education carried out, who was responsible for educating the staff, what education strategies were used, and what hospital staff was included in the educational offerings?

Tables 18 through 26 display findings for the total group and then separated into the two groups--the group that reported CAUTI rates and the group that did not.

Education completed responses reported by frequencies for the total group are displayed in Table 18.

Total Group Responses: Education.

Education completed.

Table 18

Total Group--Education by Reported Frequencies

(N=38)

<u>Total Group</u>	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
<u>Education</u>	Number (Percent)				
Education Date Reported	6 (16%)	1 (3%)	1 (3%)	1 (3%)	1 (3%)
Education Date Not Reported	1 (3%)	0	3	0	1 (3%)

Table 18 (continued)

Education Not Completed	0	1 (3%)	0	1 (3%)	0
Education Left Blank	4 (11%)	3 (8%)	1 (3%)	3 (8%)	10(26%)

Overall, 17 of the 38 hospitals (approximately 50%) reported educational CAUTI implementation prevention processes. Of the 17 hospitals, 13 were rural--seven were fewer than 100 beds, nonprofit, while one hospital had more than 100 beds. Five of the 13 rural hospitals were for-profit, fewer than 100 beds, while one had more than 100 beds. Four of the 17 hospitals were urban, nonprofit, with more than 100 beds.

Education date. Twelve of the 17 hospitals (75%) reported an actual date for the CAUTI prevention program. In 2009 two nonprofit hospitals (one urban more than 100 beds and one rural with fewer than 100 beds) instituted an education program on CAUTI prevention processes.

In 2010 two rural hospitals with fewer than 100 beds (one for-profit and one nonprofit) provided CAUTI prevention education to the staff.

Five of the 12 respondents reported an educational program on CAUTI prevention conducted in 2011 (three were rural, two had fewer than 100 beds, nonprofit while one was for-profit with more than 100 beds). Two of the five hospitals were urban, nonprofit with more than 100 beds.

In 2012 three of the 12 hospitals-- two rural, nonprofit, with fewer than 100 beds and one with more than 100 beds offered education for CAUTI prevention.

Five hospitals affirmed that an educational program was completed, but did not report

when it occurred. Four of the five hospitals were rural, fewer than 100 beds--three were for-profit and one nonprofit. One of the five hospitals was urban, nonprofit with more 100 beds.

Total group responses reported by frequencies on how education was carried out in the hospitals are reported in Table 19.

How education was carried out.

Table 19

Total Group--How Education Was Carried Out by Reported Frequencies

(N=38) Total Group	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban >100 Beds Non Profit
How Education Was Carried Out	Number (Percent)				
Small Groups	3 (8%)	1 (3%)	1 (3%)	2 (6%)	3 (8%)
Department Mtg.	4 (11%)	0	1 (3%)	0	4 (11%)
Online	4 (11%)	1 (3%)	1 (3%)	0	3 (8%)
Other	0	0	0	1 (8%)	0

Fourteen of the 38 ICPs answered how this education occurred: small group meetings, departmental meetings, online, and “other”.

Three of 14 hospitals used departmental meetings and online offerings. Two of the three hospitals were rural with fewer than 100 beds--one nonprofit, while one was for-profit. One of the three hospitals was urban, nonprofit with more than 100 beds.

Two of the 14 hospitals (both rural, for-profit--one with more than 100 beds, 1 with fewer than 100 beds) used small groups only.

All three education venues plus “other” were used by two rural, nonprofit hospitals with, fewer than 100 beds they identified “other” as “competency days” and “one on one”.

One rural, nonprofit hospital with fewer than 100 beds used small group meetings, departmental meetings, and “other” identified as a “safety fair” for the education program delivery.

One rural, for-profit hospital with more than 100 beds used small group meetings and listed “other” as “posters, handouts and potty training” to provide CAUTI education.

One rural, nonprofit hospital with fewer than 100 beds used only online offerings for staff education.

One urban, nonprofit hospital with more than 100 beds utilized small group meetings, departmental meetings, and online to provide education for staff.

One urban, nonprofit hospital with more than 100 beds provided staff education using small group meetings and departmental meetings.

One urban, nonprofit hospital with more than 100 beds provided staff education using departmental meetings and online offerings on CAUTI prevention.

One rural, nonprofit hospital with more than 100 beds used small group meetings and online education for staff education.

Inconsistencies in data reporting. Three issues were identified--one rural, for-profit hospital with fewer than 100 beds responded “Yes” to implementation of an educational program but, answered “No” to how the education was carried out, who was responsible for educating the staff, and “Yes” to demonstrations as an education strategy.

One rural, for-profit hospital with more than 100 beds answered “No” to implementation of an education program but reported that education was carried out by small group meetings, by the education department, using handouts and demonstrations as strategies.

One rural, nonprofit hospital with fewer than 100 beds answered “Yes” to an education program but, “No” to the questions on how it was carried out, who was responsible for the education, and the strategies used.

Total group responses for who was responsible for education are reported in Table 20.

Who was responsible for education.

Table 20

Total Group--Who was Responsible for Education by Reported Frequencies

(N=38)

<u>Total Group</u>	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban >100 Beds Non Profit
Who Was Responsible for Education	Number (Percent)				
Educator	6 (16%)	1 (3%)	1 (3%)	0	4 (11%)
Nurse Manager	5 (13%)	1 (3%)	0	1 (3%)	2 (5%)
Infection Control	6 (16%)	1 (3%)	0	1 (3%)	2 (5%)

Fourteen of 38 responded. Six of the 14 hospitals (five were rural, nonprofit with fewer than 100 beds while one was urban, nonprofit with more than 100 beds) reported that the Education Department, Infection Control, and Nurse Managers were responsible for educating the staff on the CAUTI implementation processes.

Three of the 14 hospitals (two rural--one was nonprofit with fewer than 100 beds, one for-profit with more than 100 beds, and one urban nonprofit with more than 100 beds) relied on the Infection Control Department and Nurse Managers.

Two hospitals (one rural, for-profit with fewer than 100 beds and one urban, nonprofit with more than 100 beds) exclusively used the Education Department for CAUTI prevention education.

One rural, nonprofit hospital with fewer than 100 beds used the Education Department and the Infection Control Department.

Education Department and Nurse Managers were used in one urban, nonprofit hospital with more than 100 beds.

One rural, for-profit hospital with fewer than 100 beds used the Infection Control Department to provide the CAUTI education for the staff.

Three of the 14 hospitals (two urban nonprofit with more than 100 beds and one rural, for-profit with fewer than 100 beds) did not include the Infection Control Department in the education of the staff on CAUTI prevention processes.

Education strategies. Educational strategy data were analyzed for 17 of 38 hospital responses received. Of the 17 responses examined--three are outliers.

Of the 14 responses six hospitals (four nonprofit, two rural with fewer than 100 beds and two urban with more than 100 beds) reported using handouts, audio-visuals, and demonstrations. Two of the six hospitals (rural, for-profit with more than 100 beds) also used all three of the methods.

Four of the 14 respondents were nonprofit hospitals (two urban with more than 100 beds and two rural with fewer than 100 beds) used handouts and audio-visuals.

Handouts were used by two rural, nonprofit hospitals (one with fewer than 100 beds and

one with more than 100 beds) for educating staff members on CAUTI prevention.

One rural, nonprofit hospital with fewer than 100 beds hospital used handouts and demonstrations as education strategies.

One rural, nonprofit hospital with fewer than 100 beds used audio-visual and demonstrations for staff education.

Inconsistencies in reporting. Three issues were examined--all were rural, for-profit hospitals with fewer than 100 beds. One hospital reported that demonstrations were used as an education strategy, no method was given for the educational venue, and no one was listed as responsible for the education.

One hospital reported-- no education program implemented, nor how the education was conducted, nor who was responsible for the education, but, listed demonstration as a strategy.

One hospital reported that an education program was implemented and that demonstration was the strategy used in a small group meeting but did not list who was responsible for conducting the educational program.

Staff included in education for the total group are displayed in Table 21.

Staff included in education.

Table 21

Total Group--Who Was Included in Education by Reported Frequencies

(N=38)					
<u>Total Group</u>	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
Who Was Included in Education	Number (Percent)				
MDs	2 (5%)	1 (3%)	2 (5%)	1 (3%)	2 (5%)
RNs	6 (16%)	1 (3%)	1 (3%)	1 (3%)	4 (11%)
LPNs	6 (16%)	1 (3%)	1 (3%)	1 (3%)	3(8%)
NAs	5 (15%)	1 (3%)	1 (3%)	1 (3%)	3 (8%)
Ancillary	2 (5%)	0	1 (3%)	0	0

Fourteen of 38 responded. In summary, 5 of the 14 hospitals included physicians and nurses in the educational process for reducing or eliminating CAUTIs. Four of the 14 hospitals included nurses in the educational program. One of the 14 hospitals offered education only to physicians. One of the 14 hospitals included registered nurses in their educational offering on CAUTI prevention initiatives. One of the 14 hospitals included nurses and the ancillary departments. One of the 14 hospitals provided education on CAUTI prevention processes to physicians, nurses, and ancillary departments. One of the 14 included physicians, nurses, and the

radiology department in staff education CAUTI prevention processes.

One rural, for-profit hospital with fewer than 100 beds only educated physicians on CAUTI prevention processes. One urban, nonprofit hospital with more than 100 beds included registered nurses as the only staff included in CAUTI prevention education.

Five of the 14 hospitals included physicians, registered nurses, licensed practical nurses, and nurse aides in CAUTI education. Of the five hospitals--three were rural, two nonprofit, one with more than 100 beds and one with fewer than 100 beds. The remaining two hospitals were urban, nonprofit with more than 100 beds.

One of the 14 respondents (a rural, nonprofit hospital with fewer than 100 beds) offered CAUTI education to registered nurses, licensed practical nurses, nurse aides, laboratory, housekeeping, radiology, and the Medical Executive Committee.

One rural, for-profit hospital with fewer than 100 beds, included physicians, registered nurses, licensed practical nurses, nurse aides, laboratory, housekeeping, and radiology staff for CAUTI education.

One of the 14 hospitals--a rural, nonprofit hospital with fewer than 100 beds educated physicians, registered nurses, licensed practical nurses, nurse aides, and the Radiology Department in CAUTI prevention processes.

One of the 14 hospitals (rural, nonprofit with fewer than 100 beds) offered CAUTI prevention process education to physicians, registered nurses, and nurse aides.

Three of the 14 hospitals (one urban, nonprofit, hospital with more than 100 beds and two rural, nonprofit with fewer than 100 beds) included registered nurses, licensed practical nurses, and nurse aides for CAUTI prevention education.

In the narrative below the group that reported CAUTI rates responses are discussed concerning the education processes that were undertaken in their hospitals for CAUTI prevention initiatives.

Those That Reported CAUTI Rates.

Education completed. Five hospitals that reported CAUTI rates gave education implementation dates for CAUTI process initiatives. One rural, for-profit, hospital with fewer than 100 beds implemented an educational program in 2010. In 2011 three hospitals implemented education programs on CAUTIs process initiatives--two urban, nonprofit hospitals with more than 100 beds and one rural, for-profit, with more than 100 beds. In 2012 two hospitals implemented educational programs--both rural, nonprofit, one with more than 100 beds and one with fewer than 100 beds.

How education was carried out. Of the seven hospitals who reported CAUTI rates (one urban, nonprofit, with more than 100 beds) used small group meetings, departmental meetings, and online offerings for educating the staff on the CAUTI processes.

Three hospitals used departmental and online offerings for the educational venues--two rural, hospitals with fewer than 100 beds, one for-profit and one nonprofit. One of the three hospitals was an urban, nonprofit, with more than 100 beds.

Online education was used as a sole source method in one rural, nonprofit hospital with fewer than 100 beds. One rural for-profit hospital with more than 100 beds used small group meetings and “other”--handouts, posters, and potty training.

Who was responsible for education. The responsibility for education of the staff in the seven hospitals that reported CAUTI rates were examined. Four of the seven hospitals reported using the Educational Department, the Infection Control Department, and the nurse manager--three of the four hospitals were rural, nonprofit, two had fewer than 100 beds, while one had more than 100 beds. One of the four hospitals was an urban, nonprofit hospital with more than 100 beds.

Two of the seven hospitals assigned the responsibility for educating the staff to the Infection Control Department and the nurse managers--both hospitals had more than 100 beds, one was rural, for-profit while one was urban, nonprofit.

One rural, for-profit hospital with fewer than 100 beds used the ICP as the sole source for staff education on the CAUTI prevention processes.

Educational strategies. Educational strategies were used by all seven hospitals that reported CAUTI rates. Four of the seven hospitals reported using handouts, audiovisuals, and demonstrations (three of the four were rural--two had fewer than 100 beds, one nonprofit and one for-profit); while one for-profit had more than 100 beds--while the fourth was urban, nonprofit, with more than 100 beds.

Staff that was included in education for the hospitals that reported CAUTI rates are displayed in Table 22.

Staff included in education.

Table 22

Those That Reported CAUTI Rates--Who Was Included in Education by Reported Frequencies

(N=7) Those That Reported CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
Who Was Included in Education	Number (Percent)				
MDs	1(14%)	1(14%)	1(14%)	1(14%)	1(14%)
RNs	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)
LPNs	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)
NAs	2(29%)	1(14%)	1(14%)	1(14%)	2(29%)
Ancillary	2(29%)	0	1(14%)	0	0

The data for which staff were included in the educational offerings were analyzed.

Physicians were included in the education on the CAUTI prevention process in five of the seven hospitals that reported CAUTI rates--four rural hospitals (two of the four rural hospitals were for-profit--one had fewer than 100 beds, one hospital had more than 100 beds; two of the four rural hospitals were nonprofit, one with fewer than 100 beds, one with more than 100 beds. One of the five hospitals was an urban, nonprofit hospital with more than 100 beds.

Registered nurses, licensed practical nurses, and nurse aides were included in all seven hospitals that reported CAUTI rates.

Ancillary departments were included in two of the seven hospitals (two rural with fewer than 100 beds, one for-profit and one nonprofit) reported CAUTI rates.

Two of the three hospitals included laboratory, housekeeping, and radiology--two were rural, with fewer than 100 beds, one was for-profit and one was nonprofit. One rural, nonprofit hospital with fewer than 100 beds only included the radiology department in the education of CAUTI prevention processes.

Education completed in the group that did not report CAUTI rates is displayed in Table 23.

Those that did not report CAUTI rates: Education.

Education completed.

Table 23

Those That Did Not Report CAUTI Rates--Education by Reported Frequencies

(N=31)

Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
Education	Number (Percent)				
Education Date Reported	4 (13%)	0	0	0	1 (3%)

Table 23 (continued)

Education Date Reported No Date Education Not Done Education Left Blank	1 (3%)	0	3 (8%)	0	1 (3%)
	0	0	1 (3%)	1(3%)	0
	4 (13%)	3 (8%)	1 (3%)	3(8%)	8(26%)

Ten of the 31 respondents that did not report their CAUTI rates affirmed that education was completed. This is the rationale for selecting these 10 though many of the other elements were answered “No”.

Education date. Five of 31 hospitals reported dates for educational programs.

In 2009--two nonprofit hospitals (one urban with more than 100 beds and one rural fewer than 100 beds) carried out education the staff on CAUTI prevention.

In 2010 (one rural nonprofit hospital with fewer than 100 beds) reported education was completed for their staff on CAUTIs.

In 2011--two rural nonprofit hospitals, with fewer than 100 beds; confirmed educational programs were carried out. The other four hospitals responded “Yes” to the question regarding if an education program was conducted (three rural, nonprofits with fewer than 100 beds and one urban, nonprofit, more than 100 beds). One rural, for-profit hospital with fewer than 100 beds answered “No” to the education date but did say it was carried out in small group meetings by the Education Department.

How education was carried in the group that did not report CAUTI rates is displayed in Table 24.

How education was carried out.

Table 24

Those That Did Not Report CAUTI Rates--How Education Was Carried Out by Reported Frequencies

(N=31) Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non- Profit	Rural > 100 Beds Non- Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non- Profit
How Education Was Implemented	Number (Percent)				
Small Groups	3(10%)	0	1(3%)	1(3%)	2(7%)
Department Mtg.	3(10%)	0	0	0	2(7%)
Online	0	2(7%)	0	0	2(7%)
Other	4(13%)	0	0	0	0

Education venues for the 10 hospitals who reported having an educational program were examined.

Five of the 10 hospitals reported using small group meetings, departmental meetings, and online offerings--all five of the hospitals were nonprofit (three were rural, with fewer than 100 beds and two were urban with more than 100 beds).

Two of the 10 hospitals reported none of the education venues listed on the survey was used--both were rural, with fewer than 100 beds--one was a for-profit while one was nonprofit.

Three of the 10 hospitals identified they used safety fairs, competency days and one-on-one education--all three hospitals were rural, nonprofit, with fewer than 100 beds.

Who was responsible for education in the hospitals that did not report CAUTI rates is displayed in Table 25.

Who was responsible for education.

Table 25

Those That Did Not Report CAUTI Rates --Who was Responsible for Education by Reported Frequencies

(N=31)

Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For-Profit	Rural >100 Beds For-Profit	Urban > 100 Beds Non Profit
Who Was Responsible for Education	Number (Percent)				
Educator	4(13%)	0	0	1(3%)	2(7%)
Nurse Manager	3(10%)	0	0	0	0
Infection Control	4(13%)	0	0	0	0

Examining who had the responsibility for conducting education was reported in 6 of 10 that affirmed having an educational program either by giving a date or answering “Yes”.

Two of the hospitals used the Education Department--one hospital was rural, for-profit,

with more than 100 beds while one hospital was urban, nonprofit, with more than 100 beds.

Two of the six were rural, nonprofit, with fewer than 100 beds. They used the Education Department, the Infection Control Department, and the nurse managers to provide education on the CAUTI prevention processes.

One of the remaining hospitals (rural, nonprofit, with fewer than 100 beds) had the Education Department and the Infection Control Department be responsible for staff education.

One urban, nonprofit, hospital with more than 100 beds assigned the Education Department and the nurse managers responsible for educating staff.

Staff that was included in the educational offering for the hospitals that did not report CAUTI rates is displayed in Table 26.

Staff included in education.

Table 26

Those That Did Not Report CAUTI Rates --Who Was Included in Education by Reported Frequencies

(N=31) Those That Did Not Report CAUTI Rates	Rural < 100 Beds Non Profit	Rural > 100 Beds Non Profit	Rural < 100 Beds For- Profit	Rural >100 Beds For- Profit	Urban > 100 Beds Non Profit
Who Was Included in Education	Number (Percent)				
MDs	1(3%)	0	1(3%)	0	1(3%)
RNs	4(13%)	0	0	0	2(7%)

Table 26 (continued)

LPNs	4(13%)	0	0	0	1(3%)
NAs	3(10%)	0	0	0	1(3%)
Ancillary	0	0	0	0	0

Staff involvement was reported in 10 hospitals that provided education for CAUTI processes. Only 4 of the 10 hospitals included physicians in the educational program--three of the four hospitals were rural, with fewer than 100 beds, two were nonprofit while one was for-profit. Included in this number was one rural, for-profit, fewer than 100 bed hospital who educated physicians only. One of the four hospitals was urban, nonprofit, with more than 100 beds.

One of the six hospitals reported only registered nurses were included in education on the CAUTI prevention processes--one urban, nonprofit hospital with more than 100 beds.

Three hospitals included registered nurses, licensed practical nurses, and nurse aides in education--two were rural, nonprofit, with fewer than 100 beds, while one hospital was urban, nonprofit with more than 100 beds.

The ancillary departments were not included in education programs within these hospitals.

Outcomes

The last section of the data analysis focuses on the outcomes section.

The research questions were:

3. Is there a significant difference in hospitals in a southeastern state's CAUTI rates from 2009 as compared to 2010?
4. Is there a significant difference between profit and nonprofit hospital rates from 2009 to 2010?
5. Is there a relationship between Registered Nurse staffing levels and CAUTI rates in a southeastern state's hospitals from 2009 to 2010?
6. Is there a difference between the use of an established nurse-patient ratio and CAUTI rates in a southeastern state's hospitals from 2009 to 2010?

Only seven respondents reported their CAUTI rates in 2009 and 2010 so the number of respondents was too low to run a logistic regression as planned. Research Questions 1 through 4 are answered using descriptive statistics.

The survey questions used to answer the research questions were:

- What was the CAUTI rate for 2009?
- What was the CAUTI rate for 2010?

The results shown in Table 27 illustrate key components from the research questions and relevant issues surrounding processes involved in CAUTI initiatives such as: technical, prevention and educational. The first group in Table 27 is the hospitals that reported CAUTI rates the second group separated by a bold line in the chart were the 10 hospitals that did not

report CAUTI rates, but did report a date for education on the CAUTI initiative.

Table 27

Outcomes By Group That Reported CAUTI Rates: Compared to Group That Did Not report CAUTI Rates Using Key Components From Research Questions

(N=17)

Respond. #	Hospital Information			Education			Prevention			CAUTI Rates			
	Size	Location: Rural or Urban	Ownership: Profit or Non Profit	Staffing Ratio	Implementation of Ed.	Responsible for ED: Nurse manager, ICP, Educator	Staff Educated: MD, Nurses, Ancillary	IHI Recommendations	Add. Measures: Check Lists, Policies	Add Procedures: f/c off floor, tubing Not kinked and secure to leg	Implementation	2009	2010
34	>100	R	P	Y	2011	ICP, NM	All Exc. Ancil.	Y	All	All	2011	3.93	4.84
38	<100	R	NP	Y	2012	ICP, NM	Nurses, Ancil.	Y	All	All	2011	1.00	1.00
40	<100	R	P	-	2010	ICP	All	Y	All	All	2010	0.00	0.25
41	>100	U	NP	Y	2011	ICP, NM	Nurses Ancil	Y	-	All	-	3.70	2.00
54	>100	R	NP	-	2012	All	Nurses	Y	Policy	All	2010	1.56	1.73
55	>100	U	NP	-	2011	ICP, NM	All Exc.	Y	All	All	-	0.70	1.90
57	<100	R	NP	Y	2012	All	All	Y	All	All	2012	1.00	1.00
5	<100	R	P	N	Y	No	None	N	CK. L	N	N	-	-
21	<100	R	P	N	N	ED	None	N	N	N	N	-	-
23	<100	R	NP	N	Y	No	No	N	N	N	N	-	-
39	>100	U	NP	N	Y	No	Nurses	Y/2	All	All	N	-	-
44	>100	R	NP	Y	2011	ICP, NM	Nurses	Y	Policy	All	Y	-	-

Table 27 (continued)

Respond. #	Hospital Information					Education			Prevention			CAUTI Rates	
	Size	Location: Rural or Urban	Ownership: Profit or Non Profit	Staffing Ratio	Implementation of Ed.	Responsible for ED: Nurse manager, ICP, Educator	Staff Educated: MD, Nurses, Ancillary	IHI Recommendations	Add. Measures: Check Lists, Policies	Add Procedures: f/c off floor, tubing Not kinked and secure to leg	Implementation	2009	2010
50	<100	R	NP	Y	Y	No	No	Y	All	All	N	-	-
61	<100	R	NP	Y	2010	All	All Exc.	Y	Y	All	2011	-	-
64	<100	R	P	Y	2011	ICP, ED	MD,	Y	Policy	Y	2012	-	-
71	>100	U	P	Y	2009	ED	All Exc.	Y	All	Y	No	-	-
72	>100	R	NP	Y	2009	ICP, ED	All Exc. Ancil	Y	Policy	Y	2012	-	-

Overall Groups

In summary, the hospitals that did not report their rates did implement some measures, and educated some members of the healthcare team. However, they did not report CAUTI rates. Both groups giving, and not giving, CAUTI rates of hospitals that provided education to their staff only included physicians in 10 of the 17 offerings. Ancillary departments were only included in two hospitals for education on the CAUTI initiative. Staffing ratios were established in nine of the 17 hospitals for the hospitals that did and did not report CAUTI rates, although the staffing mix, educational level of staff were so sparsely answered in the survey the data were not meaningful.

Respondents Who Reported CAUTI Rates

CAUTI Rates Reported for 2009

In 2009 all seven ICPs reported CAUTI rates for their hospitals. Five of the seven were nonprofit (three were rural, two had fewer than 100 beds and one with more than 100 beds; while two were urban with more than 100 beds). Two of the five hospitals were rural, for-profit (one with fewer than 100 beds and one with more than 100 beds).

Four of the seven hospitals affirmed they had staffing ratios (three were rural hospitals-- one was for-profit with more than 100 beds and two nonprofit, with one more than 100 beds and one with fewer than 100 beds). One of the four hospitals was a urban, nonprofit hospital with more than 100 beds reporting their staffing ratio.

All seven of the hospitals that reported CAUTI rates reported implementation dates for staff education on CAUTI prevention processes listed who had responsibility for education and what staff members were included.

All seven of the hospitals that reported CAUTI rates adopted all the IHI recommendations for reducing or eliminating CAUTIs.

One of seven hospitals (one urban, nonprofit with more than 100 beds) did answer the question regarding the use of additional measures in CAUTI prevention processes. All seven of the hospitals adopted additional procedures for the prevention of CAUTI prevention.

Two of the seven hospitals (both urban, nonprofit, with more than 100 beds) did not answer the question for an implementation date for the CAUTI prevention processes.

CAUTI Rates Reported for 2010

Four of the seven hospitals that reported CAUTI rates in 2009 showed an increase in CAUTI rates for 2010. Three of the four hospitals were rural (two were for-profit, one with more than 100 beds and one with fewer than 100 beds, while one was nonprofit with more than 100 beds).

One of the four hospitals that showed an increase in CAUTI rates for the year 2010 was an urban, nonprofit hospital with more than 100 beds.

Three of the four hospitals that had an increase in CAUTI rates in 2010 (two nonprofit, both with more than 100 beds, one rural and one urban) left the question blank for staffing ratio. One of the four hospitals, rural, for-profit with fewer than 100 beds, did not answer the question about a staffing ratio.

One of the seven hospitals (urban, nonprofit, with more than 100 beds) reported a decrease from the 2009 CAUTI rate. This was also the same hospital that did not answer the questions regarding adopting additional measures nor had given an implementation date for CAUTI prevention processes.

Two of the seven hospitals reported the same rate for 2010 as in 2009. Both were rural, nonprofit hospitals, with fewer than 100 beds. These two hospitals reported staffing ratios, implementation dates for staff education and CAUTI processes, adopted all the IHI recommendations, and all additional measures and procedures.

Implications of this data analysis are discussed in Chapter 5.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

This chapter includes the relevant findings of the survey's data analysis and then is related to the relevance of the findings to nursing practice, nursing education, and nursing research. The outline for discussion of the data analysis is divided into the three components of Donabedian's Model of assessing quality of care, Structure, Process, and Outcome.

Structure

The first section Structure, relates to the material resources, facilities, number and variety and qualifications of personnel, and organizational characteristics.

Research Question 1. Were hospital structural factors (rural or urban location, for-profit or nonprofit status, staffing mix, and RN educational level) a predictor of CAUTI rates in 2009 and 2010?

The structure designates the conditions under which care is provided and could be the major determinant of the quality of care that the hospital can offer. Nurses continually adapt to changes in the care environment and the patient's health status. The association between the process of care and outcomes may be influenced by both the environment and patient factors. If the care environment is considered an organized agency, such as a hospital, then the nurse practice environment, nurse staffing, and hospital size and ownership would be structural characteristics that influence the process of care, patients and outcomes, (Lucero, Lake, & Aiken, 2009).

The elements of this structure would be human resources, and organizational

characteristics. To be able to answer this research questions it was necessary to look under Outcomes to identify how many hospitals reported CAUTI rates. In fact, only seven of the 38 ICPs reported their hospital's rate. The surveys were anonymous so the ICPs could not be contacted. Upon checking the Health & Human Services Hospital Compare Web Site more than half of the hospitals in the state where the research was conducted had CAUTI rates publicly reported for the time period July 1, 2009 through June 30, 2011. Reporting the CAUTI rates to CMS were voluntary until January 1, 2012. For some reason, most of the ICPs did not answer this survey question. Unfortunately, it was not possible to do the planned statistical tests because only seven respondents reported CAUTI rates. Instead descriptive data were used to answer the first research question due to the low number of responses.

Hospital Location

Respondents in this study were from predominantly rural hospitals (26 out of the 38); half (18) were in hospitals fewer than 100 beds; and 26 hospitals were nonprofit. Of the seven ICPs reporting CAUTI rates, results were surprising. Five were from rural hospitals (three were fewer than 100 beds, and two over 100 beds), and five were nonprofit while two were for-profit. Only two respondents were in urban nonprofit hospitals over 100 beds. One would expect that larger urban hospitals would be more likely to be taking early measures to prevent CAUTIs.

Conflicting research has been published regarding quality healthcare available in rural hospitals. Although the evidence pertaining specifically to rural areas is sparse, what does exist corroborates the general finding that, as documented for the nation overall in the *Quality Chasm* report (IOM, 2005), the level of quality falls far short of what it should be. Healthcare quality has

been described as smaller, poorer, and more isolated in rural communities where it is more difficult to ensure the availability of high-quality health services. Compared with urban communities, rural communities tend to have fewer health care organizations and professionals of all types, less choice and competition among them, and broad variation in their availability at the local level (IOM, 2005, (a)).

In 2008 Goldman and Dudley compared quality in rural hospitals in the United States, using the Hospital Compare database. The conclusion was that rural hospitals had lower performance than their urban counterparts. The rural hospitals had a lower adherence to evidence-based guidelines than urban hospitals in national reporting initiatives. So the ICPs in this study are to be commended for participating in these measures so early. In the rural hospitals that reported CAUTI rates, all five implemented the IHI four recommendations for reducing or eliminating CAUTIs, as well as adopting additional measures based on evidence-based practices, soon after these recommendations were published.

Baernholdt, Jennings, Merwin, and Thornlow (2010) conducted a recent study in rural hospitals in the southeastern United States where staff were questioned about quality care. The respondents indicated that “Quality” was much more than collecting information about quality measures. Respondents also reported keeping their knowledge and competencies up-to-date as part of quality care. Established quality indicators such as rates of falls, pressure ulcers, infections, readmission rates, and length of stay were part of the rural nurses’ everyday language. The staff nurses were very conversant about quality scores. This indicated communication to bedside staff from hospital leaders. The participants indicated their belief that quality care

required them to stay up-to-date not only in their skills and competencies, but in education in all areas of their work.

In this study education and implementation dates for CAUTI prevention processes in five hospitals took place in 2010, 2011, and 2012, after the CMS October 2008 deadline. This supports the Baernholdt et al., 2010 study as to the respondent ICPs' commitment to quality initiatives in this study. The rural hospitals who reported CAUTI rates implemented IHI recommendations, additional measures, and additional procedures, for CAUTI prevention. They used different types of catheters for their patients, even using the more expensive silver-coated.

Ownership

Sixty-eight percent of the 38 respondent hospitals in this rural state were nonprofit while the rest were for-profit hospitals. The southeastern state in this study has 71% nonprofit acute care hospitals. According to the American Hospital Association (2012) nationwide 51% of the all hospitals are non-profit. So this state has more nonprofit hospitals than the average.

In 2000 Sloan et al. conducted a study to determine how hospital ownership affects performance in terms of program cost and quality. In the analysis, the researchers used data from a national panel of elderly patients who were admitted to nonfederal, short-term general hospitals for one of four major health shocks (hip fracture, stroke, coronary heart disease, or congestive heart failure). The researchers used Medicare claims data for those patients for 1982–1995, which were merged with household survey data. The research indicated that quality measured in terms of survival, changes in functional and cognitive status, and living arrangements, showed no differences in outcomes by hospital ownership.

Landon et al. (2006) conducted a study that linked performance data (reported to either the CMS or the JCAHO for the first half of 2004 from more than 4000 hospitals) to data on hospital characteristics obtained from the American Hospital Association (AHA) National Survey of Hospitals. This study addressed two important questions. First, what was quality of care in US hospitals for three common medical conditions: myocardial infarction, congestive heart failure, and pneumonia, using the expanded set of indicators available through The Joint Commission. Second, what hospital characteristics were associated with high-quality performance? The results showed patients are more likely to receive high quality care in not-for-profit hospitals and in hospitals with high registered nurse staffing ratios and more investment in technology.

In this study of the seven respondents that reported CAUTI rates for both 2009 and 2010, only one reported a decrease in CAUTI rates (urban nonprofit with more than 100 beds) and took all the measures (described in this study) to decrease CAUTI rates. This would seem to support Landon et al.'s (2006) findings in their research study about non-profit hospitals. In addition, two rural nonprofit hospitals with fewer than 100 beds had CAUTI rates that remained the same, even though they took all measures to decrease CAUTI rates. Lastly, even though they took all CAUTI measures, three hospitals had an increase in CAUTI rates in 2010 (one urban nonprofit over 100 beds, and two rural for-profit hospitals (one fewer than 100 beds, and one over 100 beds). This is discussed more under Outcomes.

Human Resource

ICP Role

The scope of practice of the ICP has expanded beyond the traditional role. The ICP is no longer just a single practitioner who spends the majority of time collecting data. The role has now, with the advent of financial incentives placed on hospitals by CMS, evolved into roles that are crucial for the financial health and survival of hospitals. They have now become leaders for subject matter expertise in infection control prevention, consultation in prevention efforts and initiatives, and education for all staff members based on evidence-based practices (APIC, 2008; Manning, Borton, & Rumovitz, 2012; Murphy et al., 2012).

The demographics in the survey were designed to reflect whether respondents (we could not actually identify who they were) were leading the effort for infection control activities in hospitals. Their role as a leader for patient safety provides the *structure* on which the Infection Control Program is carried out.

This was the case in this study. Of the ICPs reporting CAUTI rates, six of the seven ICP respondents indicated they had responsibility for doing education on prevention of CAUTIs. In the overall group, 10 of 14 respondents who actually answered this question had responsibility for education. In this study this responsibility was usually shared with nurse managers and educators.

The survey questions asked for the years of experience in their role as ICP, years of experience as a Registered Nurse, gender, age and level of education attained. Eighteen of the 38 respondents answered the questions. All respondents were female. Ten of the respondents had

fewer than 5 years of experience, while the remaining 8 had 6 to 20 years. Interestingly, one respondent reported one year experience as a RN, but two years as ICP. She may have meant that she had been an RN one year before she became the ICP. All ICPs in this study who answered this question were RNs. However 58% in the study did not answer the question about years as an RN. So whether all ICPs were RNs in this study is unknown.

Given the complexity of the role of the ICP according to the Competency Model developed by APIC, (2012), it is highly unlikely that an unlicensed person would be in the role of an ICP.

In this study the years of experience as a RN revealed a wide range of years, as 13 of the respondents reported 10 to 50 years experience in the RN role. Age ranges for 16 of the 38 respondents ranged from 20 years to 60 years. Educational level was answered by 14 of the 38 respondents--six of the respondents were ADNs, and seven had BSNs. Interestingly, there was not a master's level response given.

Statistics from the Board of Nursing for the southeastern state where these hospitals reside give the following statistics for the educational level of nurses in that state as of September 6, 2012:

- Vocational-TECH/Licensed Practical Nursing --15,784
- Associate Degree /Nursing--31,230;
- Baccalaureate/Nursing--18,546;
- Masters/Nursing—5,805; and
- Doctorate/Nursing--266.

Therefore, for this state the predominate number of nurses who are actively practicing are Associate Degree Nurses. This was also true for this study.

A review of research for demographic information for ICPs was conducted. A limited amount of data was available. The most recent research was conducted by Feltovich and Fabrey in 2009, and reported in 2010, for the Certification Board of Infection Control and Epidemiology. A survey was distributed electronically to ICPs in multiple healthcare settings throughout the world. A total of 3,772 responses were received from ICPs practicing in the United States. The responses found that the majority were RNs; nearly half with a baccalaureate degree, average age was 50 years with 10 years in infection control and 25 years of experience in health care.

In this study the ICPs who gave this information were RNs, however, six (16%) were ADNs while seven (18%) were BSNs with no masters in the group.

Due to the proportion of ADNs and BSNs in the southeastern state, the numbers are not surprising.

Upon examining the Association for Professionals in Infection Control and Epidemiology's (APIC) Core Competencies the role and expectations for the ICP is complex consisting of:

- identification of infectious disease processes,
- surveillance and epidemiologic investigations,
- preventing and controlling the transmission of infectious agents,
- employee/occupational health,

- management and communication (leadership), and
- education and research (Murphy et al., 2012).

Given the expectations associated with the core competencies, it would be extremely difficult for an ADN to meet these. A BSN is better prepared to meet these expectations.

Upon examining the practice of the ADN and BSN as described by the board of nursing for the southeastern state, the following brief overview is given:

- The licensed practical nurse (LPN) is prepared to function as a direct caregiver under the supervision of other licensed health professionals. The curriculum generally includes foundational science content and nursing courses with an emphasis on the clinical practice of skills learned in the classroom setting.
- The associate degree registered nurse (RN) is prepared to function as a caregiver, to work with other professional nurses and members of the health care team, and to plan and implement comprehensive health care. The curriculum includes a total of 65-70 credits with approximately half in the sciences and humanities and half in the nursing major.
- Baccalaureate Nurses are prepared to provide care to individuals, families and communities in wellness and illness settings providing comprehensive health services. They are prepared to assume positions of leadership and responsibility in a variety of practice settings. The program of study usually consists of the first two years in general education courses concentrated in the humanities, social and physical sciences. The last two years build upon this broad general education base, offering courses in both nursing theory and clinical practice. Professional issues and beginning research techniques are also part of the curriculum (Southeastern State Board of Nursing, 2012, ¶1-4).

The Joint Commission (TJC) (2012) outlines in the Human Resource Chapter: Standard HR.01.02.01--The hospital defines staff qualifications. The Element of Performance 1 (Note 1) Qualifications for infection control may be met through ongoing education, training, experience, and/or certification (such as that offered by the Certification Board for Infection Control) (TJC, 2012, (c), p. 3).

The 2012 eligibility requirements for certification in infection control from The Certification Board of Infection Control and Epidemiology is:

You are a licensed or certified healthcare professional (including, but not limited to, registered nurse, licensed / registered practical nurse (LPN, RPN), nurse practitioner, physician, medical technologist, respiratory therapist) with current registration/certification in good standing with the appropriate licensing board /certification/ governing body (e.g. state/provincial medical licensure; state/provincial nursing association or board, etc.),

- OR have a minimum of a baccalaureate degree;
- AND--You are currently working in healthcare;
- AND--Infection prevention and control is one of your primary roles / responsibilities in your current position;
- AND--You have had sufficient experience in infection prevention and control, which must include active roles in:
 - Collection, analysis, and interpretation of infection prevention outcome data;
 - AND--Investigation and surveillance of suspected outbreaks of infection;
 - AND--At least 3 of the following additional activities:
 - Planning, implementation, and evaluation of infection prevention and control measures;
 - Education of individuals about infection prevention and control;
 - Development and revision of infection prevention and control policies and procedures;
 - Management of infection prevention and control activities;
 - Consultation on infection prevention and control risk assessment, and prevention and control strategies (CIBC, 2012, p. 1).

So in retrospect, one can suppose that if a person with these qualifications can sit for the certification board, this person would be qualified to work as an ICP.

Staffing Ratios

The intent of this question on the survey was to ascertain if the hospitals had an established staffing plan, what was the ratio and what was the staffing mix. Numerous research studies consistently demonstrated a significant relationship between low RN staffing levels and adverse patient outcomes, including higher mortality rates and lower levels of patient satisfaction (Aiken, Clarke, & Sloane, 2002; Aiken, Clarke, Sloane, Lake, & Cheny, 2008; Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Aiken, Smith, & Lake, 1994; Blegen & Vaughn, 1998; Cimiotti, Aiken, Sloane, & Wu, 2012; Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005; Hall, Doran, & Pink, 2004; Hugonnet, Villaveces, & Pittet, 2007; Kovner & Gergen, 1998; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002; Sovie & Jawad, 2001; Rafferty et al., 2007; Unruh, 2008).

Four of the seven respondents who reported CAUTI rates affirmed that they had a staffing ratio--one urban nonprofit hospital over 100 beds; one rural nonprofit with fewer than 100 beds, one rural nonprofit with fewer than 100 beds, and one rural for-profit hospital over 100 beds. For the hospitals that did not report CAUTI rates--only six answered "Yes" that they had a staffing plan and four said they did not have a staffing plan even though they had taken additional measures to prevent CAUTIs. Not enough data were given to determine staff ratio data.

These findings were surprising. All hospitals that received a survey were Joint Commission accredited and therefore granted deemed status by CMS (meaning that they could bill CMS for services--see the explanation that follows) which meant that they would have had to provide staffing ratio information to achieve this status.

In order for a health care organization to participate in and receive payment from, the Medicare or Medicaid programs, it must meet the eligibility requirements for program participation, including a certification of compliance with the Conditions of Participation (CoP) set forth in federal regulations. This certification is based on a survey conducted by a state agency on behalf of the Centers for Medicare & Medicaid Services (CMS). However, if a national accrediting organization, such as The Joint Commission, has and enforces standards that meet or exceed Medicare's CoP, CMS may grant the accrediting organization "deeming" authority. Health care organizations that achieve accreditation through a Joint Commission deemed status survey are determined to meet Medicare and Medicaid requirements (TJC, 2012 (d); CMS, 2008, p. 1). All the hospitals surveyed in this study were accredited and met the deemed status requirements.

The requirements from The Joint Commission and CMS are very descriptive as to staffing plans. Joint Commission Standard PI.02.01.01 Element #12 (TJC, 2012, (e) p. 6). When the hospital identifies undesirable patterns, trends, or variations in its performance related to the safety or quality of care (for example, as identified in the analysis of data or a single undesirable event), it includes the adequacy of staffing, including nurse staffing, in its analysis of possible causes.

Adequacy of staffing includes the number, skill mix, and competency of all staff, examination of issues such as processes related to work flow, competency assessment; credentialing supervision of staff, and orientation, training and education (TJC, 2012, (e), p. 6).

CMS Medicare Conditions of Participation §482.23 (2012, p. 191):

The hospital must have a well-organized service with a plan of administrative authority and delineation of responsibilities for patient care, including determining the types and numbers of nursing personnel and the staff necessary to provide nursing care

So why were only 10 respondents reporting that they had a staffing ratio with only a few of this group actually giving the staffing ratios? Perhaps they did not know what their staffing ratio or plans was and were reluctant to ask anyone.

Other suppositions could be related to constraints from hospital leadership or fear of public opinion if they felt their staffing levels were low.

Staffing levels are set by administrators and are affected by forces that include budgetary considerations and features of local nurse labor markets. Administrative practices result in a structure of the nursing staff of an agency (nature of supervision) and staff or staff hours assigned to different subunits in a facility. These practices also affect the mix and characteristics of the nurse workforce, the model of care used in assigning staff and in providing care, and a wide range of workplace environments that affect how nurses practice (Clarke & Donaldson, 2008).

In a study conducted by Blegan, Vaughn, and Vojir, (2008), the impact of nurse supply

in geographic areas surrounding hospitals was examined. Data regarding 279 patient care units, in 47 randomly selected community hospitals located in 11 clusters in the United States were obtained directly from the hospitals from the U.S. Census report, National Council of State Boards of Nursing, and The Centers for Medicare and Medicaid Services. Once the selected hospitals agreed to be part of the study, they were further screened to determine their willingness to provide the needed data. Of the 290 hospitals included in 11 clusters, they contacted 190 by letter and then with telephone calls to the CNO. Of those, 53 hospitals agreed to participate; although six eventually could not provide the data needed. The most frequent reason for not proceeding beyond the initial contact was no response from the CNO; other frequent reasons were that, while interested, the hospital was involved in other data collection efforts or the hospital corporation or their attorneys would not allow sharing of the data requested.

Hospitals are licensed by the state in which they operate. They are required to adhere to certain guidelines and procedures. When injuries occur due to negligence on the part of nurses, radiologists, doctors, and staff, the hospitals they work for can be held financially liable. In order to expose negligence and violations of standard treatment protocols that occur in hospitals, the medical malpractice attorneys consult medical experts and private investigators in reviewing the actions of hospital staff. They subpoena medical charts, staffing reports, even video footage when available to determine why instructions weren't followed, symptoms ignored, or unsanitary conditions allowed to persist. Hospitals are usually very concerned about their reputation. When malpractice or negligence occurs that results in serious injuries or death, hospitals and their staff not only face an expensive lawsuit they also face state and federal regulators and law makers.

Findings from nursing patient safety research have the potential to establish a new standard of care, particularly in relation to skill and staff mix. Attorneys who are litigating cases involving patient safety failures are well advised to become familiar with current patient safety research (Collins, 2007).

This study focused on patient safety requirements to prevent CAUTIs, and appropriate measures to prevent them.

Process

Research Question: 2. What processes to reduce CAUTIs have been implemented by southeastern hospitals to address the evidence-based procedures recommended by CMS since 2009?

The purpose of this section is to discuss the results of the data analysis as it relates to the *Processes* used in the CAUTI prevention initiatives. This section will be divided into three sections:

- Technical processes--includes the types of catheters used and equipment purchased by the hospitals--rubber, silicone, and Texas catheters; and purchase of bladder scans, silver-coated catheters, or other.
- Prevention processes--includes additional measures: checklists, policies, and time outs; adoption of the IHI four recommendations for reduction and elimination of CAUTIs, and utilization of additional procedures--includes keeping the foley bag off the floor, securing the foley tubing to the patient's leg, and ensuring the foley tubing is not kinked.
 - Implementation processes for CAUTI initiatives sent through the hospital committees for review and approval.
 - Implementation dates for the CAUTI prevention processes to begin in the hospital.

- Education processes--Was education given to the staff on CAUTI prevention initiatives, date the education was done, how was the education carried out, outliers, who was responsible for educating the hospital staff, what strategies were used in educating the staff on CAUTI prevention processes.
 - What were the outliers in CAUTI education, and
 - What staff was included in the hospital education?

Technical Processes

Types of catheters used and equipment purchased. The response for the types of catheters used was surprising. Eighteen of the 38 respondents reported that they did not use rubber, silicone, or Texas catheters. The respondents did not elaborate on what types they used. All catheters fall under these categories except for the silver-coated.

Silver-coated catheters. Two rural hospitals with fewer than 100 beds (one nonprofit and one for-profit) reported using silver-coated catheters in combination with other types of catheters. Silver-coated catheters are expensive (~\$5 more per catheter). In this case two rural hospitals (one for-profit and one nonprofit) used the more expensive choice. It was believed that these prevented CAUTIs. Because both hospitals were rural and one for-profit, this does not agree with some of the past research that indicates that rural and for-profit hospitals' standards may not be as high. In fact, these hospitals paid more money hoping to achieve fewer infections.

Unfortunately, a recent trial has shown no statistical difference between the incidences of infection in patients treated with a silver/hydrogel catheter, as compared to a standard all-silicone device. As a result of this recent finding, it was concluded that there was insufficient evidence to support or recommend the widespread use of such modified catheters (Lawrence & Turner, 2005).

Rubber catheters. Three of the 20 respondents reported using rubber latex either solely or in combination with other types of catheters. Natural rubber latex, or polyisoprene, is a material that continues to form the basis for the majority of catheters today. The continued use of latex in the manufacturing of catheters in spite of a number of associated problems including relatively poor biocompatibility, frequency of latex allergies, and a susceptibility to infection and encrustation, is surprising (Lawrence & Turner, 2005). The researcher also found the use of rubber latex by three hospitals to be a surprising finding.

Silicone catheters. Four of the 20 respondents only used silicone catheters in their hospitals. Silicone catheters, like hydrogels, are used primarily to enhance the surface lubricity of Foley catheters. In addition to being one of the most biocompatible synthetic materials available, these catheters offer reduced toxicity and tissue inflammation, and provide a safe alternative for the patients with latex allergies. Relatively cost effective, most hospitals are switching to all silicone products due to the increasing numbers of HCW and patient's with latex allergies that can be life threatening (Lawrence & Turner, 2005).

Texas catheters. Eleven of the 20 ICPs responded that they used Texas catheters in combination with other catheters. Texas or Condom catheters are made of silicone or latex (depending on the brand or manufacturer) used for male patients and lessens the risks of urinary tract infections associated with indwelling catheters. A recently reported randomized trial comparing condom catheters with indwelling urethral catheters in hospitalized men found that use of a condom catheter instead of an indwelling catheter lowered the incidence of bacteriuria; this protective effect was seen primarily in men who did not have dementia (Saint et al., 2008).

Bladder scans. Ten of the 25 respondents reported purchasing bladder scans as part of their CAUTI prevention initiatives. Seven of the 10 were nonprofit hospitals. Four were urban hospitals with more than 100 beds. Six were rural hospitals with fewer than 100 beds: three were for-profit, and three were nonprofit.

A bladder scanner is a portable, hand-held ultrasound device, which can perform a quick, easy, and non-invasive scan of the bladder. Data are transmitted to a computer in the handheld unit to automatically calculate the bladder volume. The entire scan only takes a minute or two, is noninvasive and painless, and does not require operation by a sonographer. It eliminates the discomfort, embarrassment, unnecessary catheterizations, and risks associated with catheterization (Palese, Buchini, Deroma, & Barbone, 2010). The bladder ultrasound procedure is also referred to as bladder scanning, or the bladderscan, after the brand name of the most widely available portable bladder ultra-sound device. A dedicated portable bladder ultrasound scanner ranges in cost from approximately \$6,000 to \$10,000.

Eleven hospitals in this study reported that they had purchased bladder scans. Six were rural hospitals with fewer than 100 beds, and three were for-profit hospitals. This was an extra expense but these hospitals apparently thought the purchase was worth it. They are to be commended for making additional expenditures to prevent infections.

Prevention Process

Additional measures--Checklists, policies and timeouts. Fifteen of the 38 respondents reported using these measures in their CAUTI prevention processes. The additional measures are evidence based practices (Lo et al., 2008). According to the IHI (2011, (a), p. 2) the additional

measures are described in the terms of cost, time, difficulty, and level of evidence:

- The costs to implement checklists, policies, and timeouts are minimal--just the cost of the improvement method itself.
- The time to implement the CAUTI prevention processes take less than 12 months.
- Is moderately challenging by involving more than 1 discipline and involves a culture change.
- There is some evidence for these processes using published research studies that include control groups in some of the research (IHI, 2011, (a), p. 2).

IHI recommendations--Four recommendations: avoid the use of unnecessary catheters, insert catheters using sterile techniques, maintain catheters using appropriate guidelines, and performing a daily review. Thirteen of the 38 respondents adopted all four of the IHI recommendations. Research has shown that these recommendations have been successful in the reduction and elimination of CAUTIs (APIC, 2008; HIPAC, 2009; IHI, 2011(a), p. 1; Lo et al., 2008; Saint et al., 2008).

Additional procedures--Keeping foley bag off floor, ensuring foley catheter tubing is secured to the patient's leg, and the catheter tubing is not kinked. Only seven of the 38 hospitals acknowledged the use of additional procedures as a means to reduce or eliminate CAUTIs. Studies demonstrated the use of these additional measures to help reduce and eliminate CAUTIs (APIC, 2008; HIPAC, 2009; IHI, 2011(a), p. 1; Lo et al., 2008; Saint et al., 2008).

Interestingly, according to Health and Human Service's National Action Plan to Prevent Healthcare-Associated Infections: Roadmap to Elimination (2011) adherence to current

prevention recommendations in healthcare settings has been generally suboptimal, even when knowledge of recommended practices is sufficient. Several lines of evidence suggest that merely increasing adherence to currently recommended practices can result in a dramatic reduction in infection rates (HHS, 2011, (c), ¶2).

In this study the rural hospitals were implementing additional measures. These are simple nursing tasks that should be performed by all nursing staff.

Implementation processes--Sent through hospital committees. Nine of the 38 responded affirmed they did send the implementation processes through the hospital committees. It was interesting to note two of the seven hospitals that responded were rural, nonprofit hospitals with fewer than 100 beds--using all hospital committees, including the Board of Trustees for review and approval of the CAUTI prevention processes.

The Joint Commission (2012) (d) Leadership Chapter clearly delineates in Leadership Standard LD.01.01.01--The hospital has a leadership structure. Every hospital has a leadership structure that is formed by three leadership groups: 1) the governing body, 2) seniors managers, and 3) the organized medical staff (TJC, 2012, (d), p. 6).

The governing body is ultimately accountable for the safety and the quality of care, treatment, and services. The governing body provides for the resources needed to maintain safe, quality care, treatment, and services (TJC, 2012, (d), p. 6).

The senior managers' responsibilities are outlined in the Leadership Chapter; LD.04.04.01 through LD.04.04.07 describes the leaders' role and influence on the culture of the hospital. Leaders establish the ethical framework, in which the hospital operates,

creates policies, and procedures, and secures resources and services that support patient safety and quality care. The hospital considers clinical practice guidelines when designing or improving processes. Sources of clinical practice guidelines include the Agency for Healthcare Research and Quality and professional organizations (TJC, 2012, (d), p. 6-38).

The Joint Commission (2012) Medical Staff Chapter contains standards (MS.01.01.01 through MS.13.01.03) that describe the primary function of the organized medical staff. They are to approve and amend medical staff bylaws and to provide oversight for the quality of care, treatment, and services provided by practitioners. The medical staff engages in performance improvement activities. There is a medical executive committee to carry out medical staff responsibilities, including performance activities; the medical executive committee reports directly to the governing board (TJC, 2012, (f), p. 1-45).

The importance of these groups is clearly described in the preceding paragraphs. Of note, all of the respondents that reported CAUTI rates sent their CAUTI prevention processes through all the hospital committees, except the Board of Trustees. Two hospitals (rural, nonprofit, with fewer than 100 beds) of the 31 that did not report CAUTI rates sent their processes through the hospital committees including the Board of Trustees.

Implementation dates. It was interesting that eight of the respondents that did not report CAUTI rates, adopted the CAUTI additional measures, and seven adopted the IHI recommendations. Although many did not give the dates they implemented these measures, two

rural nonprofit hospitals with fewer than 100 beds adopted these measures in 2010, and two more rural nonprofit hospitals with fewer than 100 beds adopted these measures in 2011.

Of the seven respondents that adopted additional the IHI recommendations-- six of the seven hospitals adopted all four of the recommendations. All six of the hospitals were nonprofit-- three were rural with fewer than 100 beds while two had more than 100 beds and one was an urban hospital with more than 100 beds. One of the seven hospitals (urban, nonprofit with more than 100 beds) adopted only two of the four IHI recommendations (inserting catheters using sterile technique and performing a daily review for catheter necessity).

Even though many did not report the dates, they did implement the processes. They accepted the importance of implementing quality care to their patients and maintaining a positive reputation of their rural hospital. One would assume that for regulatory purposes they would want to complete the loop, by taking credit for the work that was done and report an implementation date.

This study shows that rural, nonprofit, and for-profit hospitals were being responsible in using nursing measures to ensure no infections. This reverses the bias against care in rural hospitals reported previously from the Landon et al. (2006) study.

Education Processes

Education completed. Overall, 17 of the 38 hospitals (approximately 50%) reported implementing educational CAUTI prevention processes. Of the 17 hospitals, 13 were Rural--seven had fewer than 100 beds, nonprofit, while one hospital had more than 100 beds. Five of the 13 rural hospitals were for-profit, with fewer than 100 beds, while one had more than

100 beds. Four of the 17 hospitals were urban, nonprofit, with more than 100 beds.

Seven of the respondents who reported CAUTI rates had education dates; while the remaining 10 respondents reported dates for the CAUTI initiative processes but did not report CAUTI rates.

This is laudatory that both rural and for-profit hospitals were implementing the educational CAUTI prevention processes. Again, this partially refutes Landon's findings reported earlier. However, with the 10 respondents who did not provide CAUTI rates, it is impossible to understand why hospitals who knew the importance of CAUTI prevention initiatives, and the processes needed to reduce or eliminate them, would not track or trend their rates.

In a recent study conducted in 2010 an electronic survey was sent to 75 acute care hospitals in the Nurses Improving the Care of Healthsystem Elders (NICHE) system. This study examined Indwelling Urinary Catheter care practices for prevention of CAUTIs focusing in three areas--1) equipment and alternatives and insertion and maintenance techniques; 2) personnel, policies, training, and education; and 3) documentation, surveillance, and removal reminders. The results from this study were disturbing at best. Most hospitals routinely used sterile technique during IUC placement; 97% of respondents reported always using sterile gloves, 89% reported always washing hands, 81% reported always maintaining a sterile barrier, and 74% reported always using a no touch technique for IUC insertion. Training in aseptic technique and CAUTI prevention occurred at 64% of the hospitals at the time of initial nursing hire; however, fewer than half of sites annually validated IUC insertion competency 47%. In the previous year

72% had provided CAUTI prevention education for nursing staff and 69% had completed a CAUTI quality improvement project. Automatic stop orders and reminders for removal of the catheter were reported as being used 56% of the time. However, 28% of the respondents reported having no CAUTI prevention policy at all (Fink et al., 2012).

The Fink (2012) research provided a grim picture of nursing practice for CAUTI prevention, demonstrating that only 89% of nurses routinely washed their hands before IUC placement, 3% of respondents did not use sterile gloves, and only 81% used a sterile barrier during IUC placement.

This national survey indicates the importance of basic nursing measures--actual practice standards--that should be met currently by all nurses. It is obvious from this Fink study that education is paramount in the successful initiation of CAUTI prevention efforts.

In this study ICPs were indicating that they were teaching about, and taking, appropriate measures to prevent CAUTIs. They are to be commended for doing this even though two thirds are from rural hospitals with fewer than 100 beds and 3% from for-profit hospitals as well.

Clearly the successful introduction of guidelines depends on many factors including the clinical context and the methods used to develop, disseminate, and implement them. A sense of ownership of the guidelines by the people asked to implement them improves the chances that they will be adopted. An implementation process that helps clinicians incorporate the guidelines' message into practice also enhances the likelihood of their being followed. Guidelines are generally doomed to failure as a quality improvement strategy when 1) seen as irrelevant to the clinician's practice, 2) produced by experts who have no understanding of the local situation,

and 3) are distributed in an impersonal way with no reminder system or feedback to assist the provider in developing compliance with them (Woodward, 2000).

In this study of hospitals in a predominantly rural state, they are to be commended as they implemented many of the CAUTI prevention processes discussed previously.

How education was carried out and educational strategies. Fourteen of the 38 respondents (almost 40%) answered the questions on how the education was presented to the staff. A variety of answers were received: handouts, audiovisuals, and small group meetings. Several hospitals reported “other” using competency days, one-on-one, safety fairs, and posters.

Education in infection control practices is essential as training can enhance compliance with policies and procedures. Face-to-face teaching by the infection control team and provision of written guidelines are still the mainstay of teaching in the hospital. On-line education indicates that staff takes the opportunity to read thoroughly the training modules during quieter night and weekend shifts. The enthusiasm for on-line training modules hopefully will help stimulate staff to access Infection Control policies and procedures. The use of on-line education has been a convenient learning source more highly favored than other more formal educational approaches as staff can use on-line offerings at their own pace and within their own time (Atack & Luke, 2008; Desai, Philpott-Howard, Wade, & Casewell, 2000; Ward, 2010).

In another study a video and poster presentation was used as a means of educating staff in a study conducted in a rural healthcare system in the United States. The group consisted of a six hospital system with 865 beds acute beds and a main hospital unit Level II trauma center with 650 beds. A video and an eye-catching poster were developed on CAUTI prevention and placed

on the different hospital units. When staff compliance was evaluated on CAUTI prevention processes, it was clear that the staff did not see the importance of this poster and video tape. Because of the low compliance with the CAUTI prevention processes, the video and poster was recirculated onto the nursing units and were made mandatory for the entire nursing staff to complete including the posttest. Compliance on the nursing units was reevaluated at the end of the reintroduction of the video and the poster CAUTI prevention education; compliance had increased from 4% to 93%-100% on some of the nursing units (Ribby, 2006).

It is clear from the literature that one educational approach alone does not meet the needs of all staff. It would be beneficial prior to initiating an educational program for hospital staff that a needs assessment be used to identify the learning methods that could best fit the staff's needs. These educational approaches need to be mandatory.

Who was responsible for education. Personnel responsible for healthcare personnel and patient education are accountable for ensuring that appropriate training and educational programs to prevent CAUTIs are developed and provided to personnel, patients, and families (Lo et al., 2008).

Fourteen (37%) of 38 respondents in this study reported that they used a combination of hospital departments (Infection Control Department, Education Department, and Nurse Managers) in educating the staff. According to CMS's Conditions of Participation (CoP) Interpretative Guidelines 42 CFR 482.42 Infection Control was examined for guidance on responsibilities for Infection Control in hospitals (CMS, 2012, p. 323-327):

CMS §482.42(a) A person or persons must be designated as infection control officer or

officers to develop and implement policies governing control of infections and communicable diseases and CMS §482.42(a)(1) Infection Control Officer is responsible for new employee and regular update training in preventing and controlling healthcare-associated infections and methods to prevent exposure to and transmission of infections and communicable diseases (CMS, 2012, (b), p. 323).

Interestingly, the Infection Department was not involved with CAUTI education for three of the respondents. The lack of involvement in the education of the staff on CAUTI prevention processes is not understood.

Staff included in education. Fourteen of the 38 respondents answered the question regarding what staff were involved in the education on CAUTI prevention processes. Only three hospitals included the ancillary staff in CAUTI prevention processes. Physicians were included in eight hospitals while one hospital only included RNs in the education offerings. The inclusion of all staff having direct patient contact was not evident in the survey results.

Direct healthcare providers (such as physicians, nurses, aides, and therapists) and ancillary personnel (such as housekeeping and equipment-processing personnel) are responsible for ensuring that appropriate infection prevention and control practices are used at all times (including hand hygiene, standard and isolation precautions, cleaning, and disinfection of equipment and the environment, aseptic technique when inserting and caring for urinary catheters, and daily assessment of whether an indwelling urinary catheter is medically indicated (Lo et al., 2008).

The Fink study (2012) found that training in aseptic technique and CAUTI prevention

occurred at 64% of the hospitals at the time of initial hire; however, less than half of the sites annually validated catheter insertion competency. Physician practices were beyond the scope of Fink's study, whether physicians who inserted catheters were provided any education or competency evaluation is unknown. Physician education and training should not be neglected, given that in this study physicians shared responsibility for catheter placement in more than 25% of the NICHE respondent sites (Fink et al., 2012). Given the fact that the lack of education, training, and competency assessment was so low for the nurses, it would be doubtful that the physicians would have a better percentage.

The complexity of care with new technology and the healthcare needs of patients have expanded the need for education to include a broader array of personnel, including nonclinical personnel in infection control practices. A successful infection control program must be comprehensive, organized, and well managed.

Outcomes

Research Question 3. Is there a significant difference in a southeastern hospital CAUTI rates from 2009 as compared to 2010?

Research Question 4 Is there a significant difference between profit and nonprofit hospital CAUTI rates from 2009 to 2010?

Research Question 5. Is there a relationship between Registered Nurse staffing levels and CAUTI rates in a southeastern hospital from 2009 to 2010?

Research Question 6. Is there a difference between the use of an established nurse-patient ratio and CAUTI rates in a southeastern hospital from 2009 to 2010?

Of the 38 respondents, 7 gave CAUTI rates. The number of respondents was too low to run a logistic regression as planned. The variables for staffing ratio and RN educational level had very few responses as well. Thus there was insufficient data for inferential statistical analysis. Instead descriptive data were used to answer the four research questions due to the low number.

In this study 7 out of 38 hospitals reported CAUTI rates for 2009 and 2010. Of the seven one hospital rate remained the same, one decreased, and five increased at small percentages. The lack of responses was particularly surprising because there were 10 hospitals that did not report CAUTI rates in the survey, yet they provided education, adopted the IHI four recommendations for reducing or eliminating CAUTIs, added additional measures for the prevention of CAUTIs, and did additional procedures to prevent CAUTIs. -

The survey was anonymous, but the ICPs may have been hesitant to reveal their rates for several reasons: embarrassment with the rates, fear of litigation, lack of cooperation from leadership, or they did not know how to calculate the rates. Another possibility is that after these hospitals implemented the IHI recommendations to reduce CAUTIs, the additional measures, and all the education, they were disappointed in the fact that their CAUTI rates did not decrease.

It is interesting to note that CAUTI rates were available on the CMS's Hospital Compare web site as an overall score for the time period July 01, 2009, until June 30, 2011. Although the rates were reported for a slight majority of hospitals in this southeastern state on CMS's Hospital Compare web site, we cannot tell whether respondents' hospitals might have provided CAUTI rates for the Compare web site as respondents were anonymous in this study.

CMS mandated that CAUTI rates be reported to the National Surveillance Health

Network (NSHN) at the CDC beginning January 1, 2012, in order to participate in CMS reimbursement. CMS uploads each hospital's data quarterly.

Data from this survey were collected the beginning of 2012. Respondents were asked to give CAUTI rates for 2009 and 2010, before CMS mandated that this data be collected. It is exemplary that the seven hospitals in this study were able to give CAUTI rates for 2009 and for 2010.

It is significant that only one of the seven hospitals (urban, nonprofit, with more than 100 beds) reported a decrease in 2010 from the 2009 CAUTI rate. This was also the same hospital that did not answer the questions regarding adopting additional measures nor had given an implementation date for CAUTI prevention processes.

Two of the seven hospitals reported the same rate for 2010 as in 2009. Both were rural, nonprofit hospitals, with fewer than 100 beds. These two hospitals reported staffing ratios, implementation dates for staff education and CAUTI processes, adopted all the IHI recommendations, and all additional measures and procedures.

Three of the seven hospitals that reported CAUTI rates in 2009 showed an increase in CAUTI rates for 2010--two were only increases of 0.25 or below but one increased 0.91. Yet, these hospitals had given implementation dates for staff education and CAUTI processes, adopted all the IHI recommendations, and all additional measures and procedures.

It is significant that even though hospitals reporting CAUTI rates followed all the measures recommended by IHI and CMS, most of the hospitals reporting CAUTI rates did not improve their rates from the previous year. Because many of these hospitals were small rural

hospitals under 100 beds, it is important to note that they only need one CAUTI occurrence to skew the data upwards.

These CMS measures to improve care to patients are very important but could penalize a small rural hospital. With so few patients, if only one occurrence gave the hospital an increased rate, this could have a boomerang effect where reimbursement goes down, even when they are doing most of the care appropriately, and are taking all the measures to ensure success.

It also suggests that the Fink et al. (2012) data about adherence to good, basic nursing practice measures--adhering to practice standards--becomes even more important.

Implications for Practice

Hospital leaders would benefit from involving various hospital committees in initiatives that change culture and practice within the entire hospital. Leadership support must be evident from the Board Room to the bedside. It is the members of the executive suite that must see that all stakeholders are involved in efforts that have such a potential financial impact on the hospital.

Failure to provide for the safety of the patients and staff by half-hearted support would be a medical, legal disaster that could destroy the reputation of the hospital and the confidence of the public. Mandatory education must be provided to all healthcare team members. Compliance with Infection Control practices must be monitored, evaluated, and reported to hospital leadership for effectiveness.

Implications for Education

One of the most important ways to address Healthcare Associated Infections is by improving the hand hygiene of health care staff. Compliance with the World Health Organization (WHO) or Centers for Disease Control and Prevention (CDC) hand hygiene guidelines will reduce the transmission of infectious agents by staff to patients, thereby decreasing the incidence of HAIs. To ensure compliance with National Patient Safety Goal NPSG.07.01.01, an organization should assess its compliance with the CDC and/or WHO guidelines through a comprehensive program that provides a hand hygiene policy, fosters a culture of hand hygiene, monitors compliance, and evaluates education programs provided to all staff and licensed independent practitioners and provides feedback (TJC, 2012, (a), p. 16). The Fink study (2012) found that only 89% of the time that staff washed their hands prior to insertion of a catheter, and 81% of the time a sterile barrier was used when inserting catheters. This is fundamental nursing, further validating the need for skills assessments for all staff members who insert catheters.

It was apparent from the responses the need for education for all staff members about infection control becomes everyone's responsibility. The physicians were not involved in a majority of educational offerings. A physician "Champion" leading the efforts for CAUTI prevention would be invaluable. Nurses, when given mandatory education, dramatically improved their practice resulting in fewer infections. Ancillary departments need to understand the importance of their own practices and how to prevent infections. They need to be held to this standard. In addition they have contact with patients and families and can assist patients and families in these prevention efforts.

Implications for Research

Further research is needed on how well CAUTI interventions are working linking actual CAUTI rates with staff practices. It would be beneficial to be sure that physicians and nurses support and implement CAUTI prevention processes and its effects on practice methods.

This study should be replicated as a longitudinal study over a period of at least five years. The researcher collected data over two years immediately following the publication of the IHI guidelines. So enough time did not pass to truly evaluate the effect of the implementation of preventive CAUTI measures.

Summary

The healthcare system has reached a critical juncture between patient safety, infection prevention, and quality of care. Significant changes in where care is and will be delivered are central issues. These changes represent an unprecedented opportunity for infection preventionists to accelerate progress toward the elimination of healthcare-associated infections (HAIs) (APIC, 2102). In a predominantly rural southeasterm state, this study demonstrated that about 40% of the hospitals surveyed are implementing CAUTI prevention processes. Yet, CAUTI rates might not be decreasing. Nationally, we need to be sure that we are not penalizing rural hospitals for having one patient who contracts a CAUTI that could really skew reimbursement data.

In thinking on an appropriate ending for this journey, I go back to Avedis Donabedian, in an interview given to Fitzhugh Mullan (2001) shortly before his death. He gave this summation on healthcare:

Systems awareness and systems design are important for health professionals but are not enough. They are enabling mechanisms only. It is the ethical dimension of individuals that is essential to a system's success. Ultimately, the secret of quality is love. You have to love your patient, you have to love your profession, you have to love your God. If you have love, you can then work backward to monitor and improve the system (Mullen, 2001, p. 140).

We are tasked to change the healthcare system by examining the structure that forms the foundation in which we deliver care to our patients by better educating the members of our healthcare team. We need to refine our processes by using research to find a better way to care for our patients that will improve our patients' outcome.

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APPENDIX

Approval Email from APIC

From: "Candis Robinson" <crobenson@apic.org>
To: "APIC Info" <AInfo@apic.org>; "Furnell Rife" <frjad@foothills.net>
Cc: "Artesha Moore" <AMoore@apic.org>
Sent: Tuesday, November 15, 2011 5:00 PM
Subject: RE: Research Study
Dear Furnell,

Thank you for contacting APIC. Please use the Directory tactfully and according to the Code of Conduct. I do not believe that contacting local members for this purpose is against the rules, however be careful not to spam anyone.

Please let me know if I may be of further assistance.

Genuine regards,

Candis Robinson
Manager, Customer Service & Engagement
extension 2610

From: APIC Info
Sent: Monday, November 14, 2011 4:59 PM To:
'Furnell Rife'
Cc: Candis Robinson; Artesha Moore
Subject: RE: Research Study

Dear Furnell,

Thank you for contacting APIC! I have forwarded your request to the appropriate department and they will get back to you in a timely manner.

If you have further questions, please do not hesitate to contact me.

Thank you and have a wonderful day!
APIC Reception
APIC - Association for Professionals in Infection Control and Epidemiology 1275 K Street
NW, Suite 1000
Washington, DC 20005
Main: (202) 789-1890
Fax: (202) 789-1899
reception@apic.org

From: Furnell Rife [<mailto:frjad@foothills.net>] Sent:
Monday, November 14, 2011 4:44 PM To: APIC Info
Subject: Research Study

Would I be allowed to contact my fellow APIC members in Kentucky to ask for voluntary participation in my research study, using the "Find a Member" function.

Thank-you
Furnell Rife

VITA

FURNELL RIFE

Personal Data: Date of Birth: June 6, 1957
 Place of Birth: Pikeville, Kentucky
 Marital Status: Married

Education: Public Schools, Betsy Layne, Kentucky
 ADN, Eastern Kentucky University, Richmond,
 Kentucky, 1978
 BSN, Eastern Kentucky University, Richmond,
 Kentucky, 2000
 MSN, Eastern Kentucky University, Richmond,
 Kentucky, 2002
 PhD, East Tennessee State University, Johnson
 City, Tennessee, 2012

Professional Experience: Charge Nurse, Highlands Regional Medical Center,
 Prestonsburg, Kentucky, 1978-1986
 Staff Nurse, McDowell Appalachian Regional Healthcare,
 McDowell, Kentucky, 1986-1987
 Obstetrical Manager, House Supervisor, Paul B. Hall
 Regional Medical Center, Paintsville, Kentucky,
 1987-2006
 Adjunct Faculty, Eastern Kentucky University
 Hazard, Kentucky (location), August 2002-December 2002

Associate Chief Nursing Officer/Infection Control
Preventionist/Employee Health, 2006-Present

Honors and Awards:

Paul B Hall Regional Medical Center's Outstanding
Supervisor: 1988, 1990, 1994, 1996, 2000, 2004

Paul B Hall Regional Medical Center's 110% Award:
1992, 1993, 1999, 2003

Department of Baccalaureate & Graduate Nursing:
Certificate of Recognition 100% Award